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VOL. 38

ARNOLD ARBORETUM
HARVARD UNIVERSITY

ARNOLDIA



VOLUME XXXVIII


1978

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BOTANICAL GARDEN

PUBLISHED BY THE
ARNOLD ARBORETUM
JAMAICA PLAIN, MASSACHUSETTS 02130



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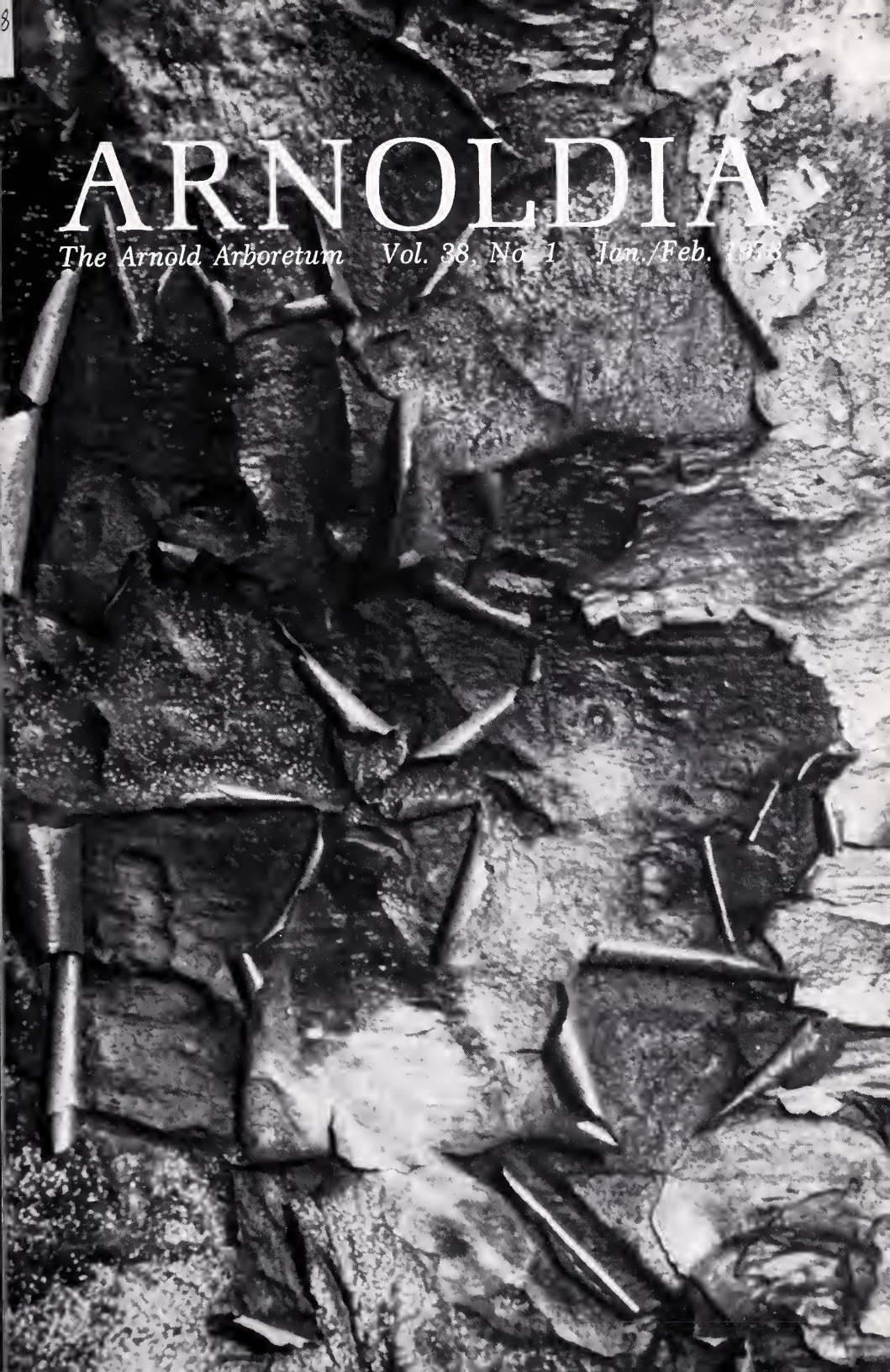
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ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Mass. 02130

*Published six times a year: in January,
March, May, July, September, and November.
Subscriptions \$8.00 per year. Single copies \$2.00.
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Cover: Paperbark Maple (Acer griseum). Photo: A. Bussewitz.

The Fire Pines

by RICHARD WARREN and ALFRED J. FORDHAM

Author's Note: When an Arnold Arboretum volunteer develops an interest in conifers, he inevitably comes under the stimulating influence of Alfred Fordham. So it happened with me. One day Al remarked on a photograph he had taken of *Pinus attenuata*. The branches were covered with closed cones all the way back to the tree trunk. The conversation then led to the question of how long seeds can remain viable in these cones. Since no answer was easily discovered in reference books, we decided to inquire more deeply. This we did by consulting source material in libraries, writing letters to various experts, and performing our own tests of seed germination in the Dana Greenhouses.

The most consistently serotinous pines, *Pinus radiata* and *P. attenuata*, are not hardy in the Arboretum. I have, however, enjoyed the privilege of frequent trips to Western Ireland where *P. radiata* is planted as a shelter from the high winds of the area. Also, fortunately, a daughter in Marin County, California, lives within an easy drive of the dry elevations of the coastal range where *P. attenuata* thrives. Material for this inquiry was obtained from these sources. (R.W.)

Among the most interesting members of the pine genus are those to which we apply the term "serotinous." The word means "late developing" and describes their distinguishing feature, the habit of holding cones closed on their branches for many years. A strong resin glues the tips of the scales together and these trees do not disperse their seeds at maturity as other pines do. In many cases seeds are not liberated until a forest fire melts the resin; hence the common name, "Fire Pines." Subsequent revegetation of the burned area is of teleological significance for the survival of the species.

Table I lists these pines. The degree to which they demonstrate serotinous tendencies varies between species, and in some of these also according to geographic location. Variation may be seen both in the proportion of cones with persisting closure and in its duration. In some trees of *Pinus banksiana*, *P. clausa*, *P. rigida* and *P. contorta*, for instance, the cones open at maturity. This seldom occurs in *P. serotina*, but later separation of scales and seed dispersion almost always occurs before five years. *P. radiata* plants in the British Isles, furthermore, hold their cones closed for a long period, but in California in exposed sunny positions they may open a year or two after ripening. Badran observed that *P. radiata* from the Monterey Peninsula showed many open cones, particularly those that were more than four years old, whereas those from most specimens found in the Berkeley-Oakland Hills area remained closed. *P. contorta*

TABLE I
SEROTINOUS PINES

West Coast U.S.A.	
<i>P. attenuata</i>	Knobcone Pine
<i>P. contorta</i>	Beach Pine
<i>P. muricata</i>	Bishop's Pine
<i>P. radiata</i>	Monterey Pine
Rocky Mountains U.S.A.	
<i>P. contorta</i> var. <i>latifolia</i>	Lodgepole Pine
Canada and Northern U.S.A.	
<i>P. banksiana</i>	Jack Pine
Eastern U.S.A.	
<i>P. pungens</i>	Table Mountain Pine
<i>P. rigida</i>	Pitch Pine
Southern U.S.A.	
<i>P. clausa</i>	Sand Pine
<i>P. serotina</i>	Pond Pine
Mexico	
<i>P. greggii</i>	Gregg's Pine
<i>P. oocarpa</i>	No common name
<i>P. patula</i>	Spreading-Leaved Pine
<i>P. pringlei</i>	Pringle's Pine
Mediterranean	
<i>P. halepensis</i>	Aleppo Pine
<i>P. pinaster</i>	Maritime Pine

also demonstrates the influence of climate on the serotinous habit. The cones of plants in coastal regions open promptly, whereas those in the Rocky Mountain and Intermountain regions are persistently serotinous. Cones of *P. attenuata* are virtually unknown to open under influences other than fire, decay, or attack by wildlife or insects. This persistence may be the result of its restricted geographical distribution in the California coastal mountains. Genetic factors also seem to play a part (Fig. 1).

The retention of cones by serotinous pines even after opening is characteristic. In the New England area it is familiar to us in the cone-peppered silhouettes of *Pinus rigida*, and in Canada of *P. banksiana*.

The relation between the cone and the branch on which it remains is of note. In the specimens of *Pinus radiata* we have observed, the cones most recently matured have had pedicels of 1 cm. As the branch has grown in diameter, the pedicels have been swallowed so that by the third or fourth year the cones have become sessile. In cones up to thirty years of age, the pedicel has continued to stretch and their bases have remained tightly pressed against the branch. In other species such as *P. banksiana* and *P. attenuata*, however, the woody tissues have been observed to grow out around the cone

Fig. 1. Closed cone characteristics can vary from tree to tree in the case of Pinus banksiana. At right is a specimen collected from a tree where some cones were closed and some were open. Below is one in which all cones are closed. Both trees were siblings grown together in a nursery row. Still other plants in the same population had cones that were all open. These characteristics are genetic, and it is not uncommon to see trees in native habitats whose cones are all serotinous growing beside trees with cones all open and still others that contain some of each. Photos: A. Fordham.



so that it becomes embedded and actually disappears within the wood (Figs. 2 and 3). Why this occurs in some species and not in others is unknown. Coker suggests that it is pure mechanics, the breadth of the surface presented to the branch being less in the narrower cones of *P. attenuata* and *P. banksiana* than in the broader ones of *P. radiata* and *P. muricata*.

The degree to which advancing age of cones may influence the germinating ability of seeds should be of particular interest to the Arnold Arboretum since Professor C. S. Sargent seems to have been among the first to ask the question. He received a branch of *Pinus contorta* from Dr. George Englemann (Fig. 4) four and a half years



Fig. 2. Cones of *Pinus banksiana* in various stages of embedment. Sister trees in the same nursery row did not engulf their cones as did this one. Photo: A. Fordham.



Fig. 3. A transverse section of a *Pinus banksiana* tree trunk, from the same tree that provided Fig. 2. It was collected at a 5-foot level from a fast growing tree in a nursery row and shows nine annual growth rings. The embedded cone is one of a pair that originated nine years ago at the tip of a shoot that was about 1/4-inch in diameter. As the trunk increased in girth during the first four years, the cone was forced outward and this caused the pedicel to elongate. Wood that formed during the fifth annual growth increment surrounded the cone and this process continued each year until only the tip remained uncovered after the 1976 growing season. In the course of another year, it seemed probable that it would have been completely hidden and the sound seeds it contained would then be lost for reproduction.

Cones of *Pinus banksiana* often appear in multiples of two and three. This illustration shows one of a pair that continued to grow, and evidence of one that failed six years ago. The annual rings show that at that time the cone was entirely exposed (not embedded at all) and may have been destroyed by a squirrel seeking seeds. It is interesting to see how annual growths have filled the void. Photo: A. Fordham.

after it had been collected from a tree in Colorado in 1874. Five years later, on planting the seeds, he observed germination for the years 1869 through 1872, but not for 1873, the most recent year, nor for the earlier years of 1865 and 1868. He commented that "this experiment is unsatisfactory owing to the want of seeds of 1866 and 1867 and because those of 1873 had probably never fully developed. It is only interesting in view of the fact that it may possibly lead to this subject being more fully investigated. It is particu-



*Fig. 4. Charles S. Sargent, Francis Skinner and George Englemann posed in Monterey, California, in 1880 toward the end of their summer trip in connection with the U. S. forest census. Note that some of the cones on the branch Sargent is holding are open and some are closed, a normal occurrence for *Pinus radiata* in coastal areas (see text).*

larly desirable to obtain and test the seeds from old serotinous cones of such species as *P. serotina*, the Florida Pine, *P. inops* var. *clausa* (*P. clausa*) *, *P. Tuberculata* (*P. attenuata*) *, *P. muricata*, and *P. insignis* (*P. radiata*) *. There are always facilities for making such experiments at the Arboretum when sufficient material can be obtained."

Although throughout the world much effort has been put into investigating methods to increase the yield of seeds of serotinous pines for forestation purposes, little attention has been devoted to answering Sargent's question: How long *can* the seeds remain viable in the cones? Now, nearly one hundred years later, we have used the Arboretum's facilities to test the influence of age on germination of seeds of cones from *Pinus radiata* collected in West Cork, Ireland. The following discussion will tell us of this experiment together with what we have been able to discover of others.

In 1909 Professor W. C. Coker of the University of North Carolina procured cones of *Pinus serotina* up to fourteen years old and germinated seeds from all years. Badran in 1949 observed germination of seeds of *P. radiata* from cones up to ten years old, and of *P. attenuata* from those up to twenty years old. Other allusions to the very long viability of seeds are Bowers, fifty years; Kotok, eighty years; Mason, seventy-five to eighty; and Mills, one hundred fifty — all for Lodgepole Pine (*P. contorta* var. *latifolia*). Exact documentation of these observations has not been possible because the original reports have not been available to us. Mirov only states: "Seed viability may be preserved within the cone for an amazingly long time." After making his tests and finding viability up to five years he said: "There are records of much longer viability of pine seeds, but it is difficult to say how reliable they are."

Our experience with two limbs from the Irish trees was as follows: In limb #1 (Fig. 5), the cone ages ranged from one to twenty-six years. We found fertile seeds up to and including twenty-one years of age, but no germination in years twenty-two through twenty-six. In limb #2 we tested twenty-one cones ranging in age from one to twenty-six years. The twenty-six-year-old seeds did not germinate. Also infertile, however, were seeds from the years two, three and five. Otherwise, all years up to twenty-four showed fertility. In sum, these two experiments showed that seeds can be viable at least up to twenty-four years. Our observation of infertility in seeds older than twenty-four years is of interest. It is clear, however that the limited scope of the experiment prevents general conclusions about maximum age of fertility with respect to the species as a whole.

We were curious about the possible cause of infertility in the cones of limb #2. On external examination and sectioning of the seeds, the twenty-six-year-old specimens all appeared sound but yet did not germinate. In the young infertile years the cones looked sound

* Names in parentheses inserted by present authors.



Fig. 5. Limb #1 showing cone whorls spanning twenty-six years. Photo: R. Warren.

but many of the seeds were shriveled or empty. This implies that the older seeds became infertile from aging whereas the younger ones had undergone some injury.

The effect of cone age on the percentage of seeds germinating from a batch of *Pinus radiata* and *P. attenuata* was documented by Badran who found a gradual decrease with time in the production of seeds that germinated. He observed also that the total number of seeds per cone, although varying between specimens, was not related to age. The percentage of empty seeds increased only slightly with age, but not in proportion to the decrease in germination. Thus, age adversely affected many apparently full seeds; furthermore, the time needed for germination was increased in the older seeds. Vogl observed no change in the above features with the passing of time, but the report does not give exact ages.

The number of seeds sown was carefully counted in one of our *Pinus radiata* limbs. We observed great variation in germinating capacities, but, as Badran noted, germination appeared to decrease with age until the last two years (twenty-two and twenty-four) when only one and three seeds, respectively, out of thirty germinated.

One further question that logically arises is whether the cones are living or dead. Although this has not been studied extensively, it is assumed that those that remain sessile must be dead, since the pedicels have become so stretched within the wood. Sargent, already mentioned, found that seeds from cones on a branch of *Pinus contorta*, taken from a tree four and one-half years before, germinated well. We have germinated seeds taken from a tree that had been dead for at least five years. Furthermore, Mirov states: "In the author's experience a *P. attenuata* cone kept at room temperature for twenty-seven years yielded germinable seed." There is no reason to suppose that seeds in a cone on or off the branch should deteriorate if kept at appropriate conditions of temperature and humidity.

Estimation of a cone's age is not always simple. This is particularly so in *Pinus radiata* where additional flushes of growth each year may produce more than one cluster of cones. Counting the number of whorls can thus result in an overestimate. This feature renders slightly unreliable many written reports involving age of cones, since the method of dating, though not usually stated, is assumed to be such a count. The annual growth rings are a reliable method, provided one recognizes that certain dry years may cause rings to be incomplete. Thus, the procuring of a total cross-sectional specimen, rather than a core sampling, is the safest method. The worry about false rings (those caused by a resumption of growth in a year when growth was temporarily arrested by some unfavorable environmental condition) can be allayed by the rarity of this occurrence and the different appearance of false rings from true ones. They fade gradually, both to the outside and the inside, whereas the true ring shows a sharp cutoff externally.

Another method of determining age, according to Badran, is the bunching together of the bud scales and the horizontal constrictions at the nodal points where the terminal buds were forced into a resting period. This is useful for only the first few years of growth, since these landmarks tend to fade with age.

In dating the cones on our two branches we used tree rings, where possible, from cross sections of the limbs. Where this was not possible because of unavailability of the sections, we counted whorls. Where there was a discrepancy between the numbers derived from the two counts, we chose the lesser in order to err on that side rather than to overestimate age.

We made other incidental observations. Although stratification of seeds in cold is not considered necessary for optimum production in *Pinus radiata*, we found in comparing one set stratified for three weeks at 4°C and one not, that the former germinated in 50 per cent to 75 per cent of the interval of time needed for the latter. Cold, however, did not produce fertility in the infertile years.

The farmers in Ireland who grow their own *Pinus radiata* trees open the cones by exposure to direct flame. Early foresters used this method. We tried opening cones by direct flame in a broiler for four to twenty-four minutes, by boiling for two to five minutes, and by heating in an oven (kiln) at 50°C (120°F) for twenty-four to forty-eight hours. Although seeds procured by each method germinated, the kiln method seemed to us the most satisfactory because with it there is no worry about seed damage if heating is carried on too long. We learned that if either of the other two methods is used, the duration of heating should be less than that tried in our experiments; not more than ten to fifteen seconds in boiling water or two to three minutes close to a flame. This is because the cone scales separate gradually after the resin is dissolved. Vogl states that in *P. attenuata*, shedding of seed does not start until one to twelve hours after heating, and that it continues up to three days later. Our impression was that this applies to *P. radiata* also. In using either rapid method for opening cones, it is important that they be removed from the heat after opening has only partially begun. Although it was of interest that boiling for five minutes and direct flame exposure to a 5-inch distance for ten minutes did not hinder germinative ability nor germinative capacity (which occurred in up to 90 per cent of the seeds so procured) there must be a limit of time after which these temperatures will kill seeds.

Badran observed a falling off in the germinative capacity of seeds with progressing years and commented on the apparent soundness ("fullness") of many of the infertile seeds. We found this also; all twenty-nine seeds that did not germinate from the twenty-two year-old cone from limb #2 looked quite healthy externally.

Although arithmetical precision cannot be hoped for in describing these features of the various serotinous species, this does not diminish our sense of wonder at the extreme patience with which these trees wait to protect and reproduce their kind in the face of their natural enemy, fire.

Acknowledgements

The assistance of John H. Alexander III, James A. Burrows, and Kenneth D. Shaw of the Greenhouse staff and of Sheila Geary, the Librarian, is gratefully acknowledged.

Helpful information was procured through the kindness of the following:

Dr. M. P. Bollmann, New Zealand Forestry Service

Dr. Stanley L. Krugman, Timber Management Research, U.S. Forest Service, Washington, D.C.

Dr. Leroy C. Johnson, Research Forester, U.S. Forest Service, Placerville, California

Dr. William J. Libby, Department of Forestry and Genetics, University of California, Berkeley

Albert G. Johnson, Research Associate, University of Minnesota, Chaska, Minn.

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Dr. Richard Warren, a regular volunteer and member of the Friends of the Arnold Arboretum, is Emeritus Professor of Surgery at the Harvard Medical School.



Arnold Arboretum Introductions: The Second Fifty Years (continued) - 1923-1972

by RICHARD A. HOWARD

In a series of papers concerning the history of the Arnold Arboretum compiled in honor of its First Century, Dr. Donald Wyman prepared a list of plants received at the Arnold Arboretum between 1923 and 1972. The first part of this list including *Abelia* through *Fraxinus* was published in *Arnoldia* (32 (1): 30-43. 1972). It largely represented plants received during the years when Donald Wyman served as horticulturist and many of the plants were obtained by him during several trips to Europe. The list as published was "to be continued" and through oversight the remainder of the manuscript was misplaced. We continue here, for the record, what was begun in 1972.

As before, the plants are listed alphabetically under the names by which they were received or listed in *Index Semina*. A few names indicated by an asterisk (*) cannot be verified in standard references, including *Index Kewensis*. In general, the names follow the nomenclature of *Rehder's Bibliography of Cultivated Trees and Shrubs* although some are now accepted as either hybrids or cultivars. These names are indicated by the sign of multiplication (×) in the case of hybrids, or are cited in single quotation marks when accepted as cultivars. We recognize that some modern works by Bean, Hillier and Krussman have realigned species concepts, cultivar status or established synonymies. We retain the original form of the name in many cases for historical perspective and for the opportunity of verifying such new assignments. A parenthetical (A) has been added following a name when the accession is still alive within our collection. As Dr. Wyman stated, "The Arboretum has long had a policy of sharing its introductions with other institutions and unfortunately we do not know whether plants which have died for us may have survived in other institutions." We repeat his request that "if any individual has firsthand knowledge that some of these have been introduced into America before the dates herein listed, we will be glad to hear about it and delete them from this list." We also would like to know of living propagations of these plants elsewhere in the United States, to help establish hardiness records.

Name	Record No.	Country	Year
<i>Fraxinus ornus</i> var. <i>juglandifolia</i>	462-25	Holland	1925
<i>Genista lydia</i>	1334-51	England	1951
" <i>patula</i>	497-39	Asia Minor	1939
" <i>tinctora</i> var. <i>anxantica</i>	575-71	Switzerland	1971
" <i>tinctoria</i> var. 'Plena'	2216-25	England	1925
" <i>tinctoria</i> 'Royal Gold' (A)	407-65	Holland	1965
<i>Gleditsia caspica</i> 'Nana'	19816	England	1926
" <i>triacanthos</i> f. <i>inermis</i> 'Columnaris' (A)	491-66	W. Germany	1966
<i>Gymnocladus dioica</i> 'Variegatus'	156-66	England	1966
<i>Hamamelis</i> × <i>intermedia</i> 'Arnold Promise' (A)	231-67	Arn. Arb.	1963
" " 'Diane'	678-66	Belgium	1966
" " 'Fire Charm'	1137-65	Holland	1965
" " 'Helena'	1138-65	Holland	1965
" " 'Hiltingbury'	562-65	England	1965
" " 'Jelena' (A)	584-65	England	1965
" " 'Ruby Glow'	684-60	Holland	1960
" <i>japonica</i> 'Flavo-purpurascens'			
" " 'Superba'	307-59	Holland	1959
" " 'Magic Fire' (A)	161-69	England	1969
" " 'Sulphurea' (A)	282-66	England	1966
" <i>mollis</i> 'Brevipetala'	588-49	Holland	1949
" " 'Gold Crest' (A)	43-67	England	1967
" " 'Pallida'	564-65	England	1965
" <i>vernalis</i> 'Lombart's Weeping'	1110-67	Holland	1967
" " 'Orange Beauty' (A)	165-66	Holland	1966
<i>Hedera helix</i> var. <i>poetica</i>	149-65	Italy	1965
<i>Hibiscus syriacus</i> 'Admiral Dewey'	626-23	France	1923
" " 'Coelestis'	632-23	France	1923
" " 'Caeruleus Plenus'	633-23	France	1923
" " 'Leopoldii'	424-56	England	1956
" " 'Leopoldii Plenus'	435-65	England	1965
" " 'Mauve Queen'	426-56	England	1956
" " 'Monstrosus'	641-23	France	1923
" " 'Roseus Plenus'	646-23	France	1923
<i>Hydangea serrata</i> 'Chinensis'	283-66	England	1966
" " 'Preziosa'	2099-65	England	1965
<i>Hypericum japonicum</i>	661-34	Holland	1934
" <i>kouyitchense</i>	211-52	England	1929
" 'Rowallane'	555-64	Ireland	1964
<i>Iberis pectinata</i>	799-63	England	1963
" <i>pinnata</i>	156-62	Belgium	1962
" var. <i>correifolia</i>	471-64	England	1964
<i>Ilex</i> × <i>altaclarensis</i>	528-34	China	1934
" <i>crenata</i> 'Golden Gem'	5-66	Holland	1966
" " 'Lutea-variegata'	592-36	England	1936
" <i>sebertii</i>	1610-63	New Caledonia	1963
<i>Indigofera pseudotinctoria</i>	1076-57	Japan	1957
<i>Jasminum artense</i> *	1609-63	New Caledonia	1963
" <i>azoricum</i>	90-62	Scotland	1962
" <i>bignoniaceum</i>	278-62	New Zealand	1962
" <i>didymum</i>	1194-63	Fiji	1963
" <i>humile</i> f. <i>farreri</i>	96-62	Scotland	1962
" <i>humile</i> f. <i>wallichianum</i>	802-62	Scotland	1962
" <i>kerstingii</i>	913-63	Ghana	1963
" <i>leratii</i>	1332-63	New Caledonia	1963
" <i>marianum</i>	1049-64	Guam	1964

Name	Record No.	Country	Year
<i>Jasminum neocaledonicum</i>	1268-63	New Caledonia	1963
" <i>noumeense</i>	1333-63	New Caledonia	1963
" <i>polyanthum</i>	95-62	Scotland	1962
" <i>rex</i>	85-62	Scotland	1962
" <i>subhumile</i>	97-62	Scotland	1962
" <i>trifoliatum</i>	98-62	Scotland	1962
" <i>volubile</i>	1496-63	Lord Howe Island	1963
<i>Juniperus chinensis</i> 'Glaucá'	953-38	England	1938
" " 'Mathot'	335-65	W. Germany	1965
" " 'Raizuka'	1783-65	England	1965
" " 'Smithii'	1051-71	England	1971
" <i>communis</i> 'Dumosa' (A)	1785-65	England	1965
" " 'Pendulina'	339-65	W. Germany	1965
" " 'Silver Lining'	1091-68	England	1968
" <i>sabina</i> 'Elegantissima'	341-65	W. Germany	1965
" " 'Reflexa'	1052-71	England	1971
" <i>semiglobosa</i> (A)	1165-61	Russia	1961
" <i>serevschanica</i>	264-36	Russia	1936
<i>Kalmia intermedia</i> (A)	624-64	France	1964
" <i>latifolia</i> 'Clementine Churchill'	1518-66	England	1966
<i>Kerria japonica</i> 'Aureo-vittata' (A)	525-36	France	1936
<i>Koelreuteria paniculata</i> 'Fastigiata'	498-37	England	1937
<i>Laburnum anagyroides</i> 'Aureum'	213-40	England	1940
<i>Larix decidua</i> var. <i>polonica</i> (A)	1633-25	Ireland	1925
" <i>gmelini</i> var. <i>olgensis</i>	648-64	Poland	1964
" <i>lubarskii</i> *	91-69	Estonia	1969
<i>Lavandula spica</i> 'Folgate'	440-65	England	1965
" " 'Hidcote'	441-65	England	1965
" " 'Hidcote Blue' (A)	560-63	England	1963
" " 'Hidcote Pink'	442-65	England	1965
" " 'Nana'	307-53	England	1953
<i>Ligustrum chenaultii</i>	151-31	France	1931
" <i>vulgare</i> 'Atrovirens'	464-36	Germany	1936
" " 'Auriflorum'	61-40	Hungary	1940
" " 'Densiflorum'	484-27	England	1927
" " 'Fastigiatum' (A)	554-65	England	1965
" " var. <i>italicum</i>	357-25	Ireland	1925
" <i>walkeri</i> (A)	29-65	Holland	1965
<i>Lindera citriodora</i>	1194-64	Japan	1964
" <i>erythrocarpa</i>	1192-64	Japan	1964
" <i>megaphylla</i>	542-35	China	1935
" <i>umbellata</i> f. <i>membranacea</i>	556-71	Japan	1971
<i>Liquidambar orientalis</i>	503-37	England	1937
<i>Liriodendron tulipifera</i> 'Contortum'	164-49	Ireland	1949
<i>Lonicera</i> × <i>bella</i> 'Polyantha' (A)	1314-62	Holland	1962
" <i>glehnii</i>	891-65	Russia	1965
" <i>lanata</i> (A)	887-65	Russia	1965
" <i>lanza</i> *	471-60	Scotland	1960
" <i>maackii</i> 'Erubescens'	31-65	Holland	1965
" <i>modesta</i> <i>luchanensis</i> (A)	765-36	China	1936
" <i>paradoxa</i>	889-65	Russia	1965
" <i>simulatrix</i>	888-65	Russia	1965
" <i>tatarica</i> 'Arnold Red' (A)	243-49	Arn. Arb.	1949
" " 'Nana'	302-59	Holland	1959
" 'Tremonia'	21-66	W. Germany	1966
" × <i>xylosteum</i> 'Nana'	220-39	Poland	1939

Name	Record No.	Country	Year
× <i>Macludrania hybrida</i> (A)	471-36	Germany	1936
<i>Magnolia campbellii</i> 'Charles Raffill'	2106-65	England	1965
" 'Charles Coates'	633-66	England	1966
" <i>denudata</i> 'Picture'	2105-65	England	1965
" " 'Purple Eye'	288-66	England	1966
" × <i>highdownensis</i>	350-49	England	1949
" × 'Kewensis'	1374-63	England	1963
" × <i>loebneri</i> 'Leonard Messel'	290-63	England	1963
" " 'Merrill' (A)	367-42	Arn. Arb.	1952
" <i>officinalis</i> var. <i>biloba</i>	666-65	England	1965
" <i>salicifolia</i> 'Concolor'	2109-65	England	1965
" × <i>soulangiana</i> 'Stricta'	75-57	England	1957
" " 'Superba'	552-52	England	1952
" <i>wilsonii</i> f. <i>taliensis</i>	194-68	England	1968
<i>Mahoberberis aquicandidula</i> (A)	423-48	Sweden	1948
" <i>aquisargentii</i> (A)	422-48	Sweden	1948
<i>Malus</i> × <i>gloriosa</i> (A)	398-36	France	1936
" × <i>moerlandsii</i> (A)	643-38	Holland	1938
" 'Blanche Ames' (A)	22994	Arn. Arb.	1955
" 'Barbara Ann' (A)	677-64	Arn. Arb.	1964
" 'Donald Wyman' (A)	232-54	Arn. Arb.	1970
" 'Dorothea' (A)	22765	Arn. Arb.	1943
" 'Golden Horner' (A)	742-55	England	1955
" 'Henrietta Crosby' (A)	531-49	Arn. Arb.	1949
" 'John Downie'	593-27	England	1927
" 'Henry F. Dupont' (A)	229-57	Arn. Arb.	1955
" 'Mary Potter' (A)	230-13	Arn. Arb.	1947
" 'Pretty Marjory' (A)	294-58	Holland	1958
" 'Upton Pyne' (A)	743-55	England	1955
" 'Van Houttei' (A)	288-58	England	1958
" 'Wisley' (A)	746-55	England	1955
<i>Menziesia ciliicalyx</i> 'Purpurea'	620-65	England	1965
<i>Metasequoia glyptostroboides</i> (A)	3-48	China	1948
<i>Morus alba</i> 'Venosa'	2152-25	England	1925
" <i>truaviensis</i> *	512-49	Czechoslovakia	1949
<i>Myrica rubra</i>	1084-57	Japan	1957
<i>Osmanthus austro-caledonicus</i>	1269-63	New Caledonia	1963
" <i>badula</i>	1607-63	New Caledonia	1963
" <i>monticola</i>	1270-63	New Caledonia	1963
" <i>vaccinioides</i>	1606-63	Maquis	1963
<i>Ostrya multinervis</i>	33-49	China	1949
<i>Pachysandra terminalis</i> 'Variegata'	525-25	Scotland	1925
<i>Parrotia persica</i> 'Pendula'	164-66	England	1966
<i>Parthenocissus tricuspidata</i> 'Gigantea'	370-65	W. Germany	1965
" " 'Glorie de Boskoop'	447-36	Germany	1936
<i>Philadelphus coronarius</i> var. <i>speciosissimus</i>	2095-25	England	1925
" <i>henryi</i>	741-33	Wales	1933
" <i>keteleeri</i>	419-23	France	1923
" <i>pekinensis kansuensis</i>	396-26	China	1926
" <i>purpureo-maculatus</i> 'Bicolor'	1719-25	France	1925
" <i>subcanus</i> var. <i>wilsonii</i>	1116-24	England	1924
" 'Beauclerk'	340-49	England	1949
" 'Belle Etoile'	1631-25	France	1925
" 'Burfordensis' (A)	358-49	England	1949
" 'Contraste'	1463-51	England	1951
" 'Dame Blanche'	651-26	Germany	1926

Name	Record No.	Country	Year
<i>Philadelphus</i> 'Enchantment'	1674-24	France	1924
" 'Fleur de Neige'	1721-25	France	1925
" 'Girandole'	1722-25	France	1925
" 'Schneeselmelse' (A)	298-63	Holland	1963
" 'Silver Rain'	282-63	Canada	1963
" 'Unique'	1148-65	Holland	1965
<i>Picea abies</i> 'Compacta'	2204-25	England	1925
" " 'Humilis'	644-67	England	1967
" " 'Phylicoides'	646-67	England	1967
" " 'Pumila Nigra'	1056-71	England	1971
" " 'Stricta' (A)	2190-25	England	1925
" " 'Waugh'	649-67	England	1967
" <i>intercedens</i>	501-40	Japan	1940
" <i>orientalis</i> 'Doverside Pendula'	983-68	England	1968
" <i>nutans</i>	477-36	Germany	1936
" <i>pungens</i> 'Spekii'	659-67	England	1967
" <i>pungsaensaensis</i>	502-40	Japan	1940
" <i>tonaiensis</i> (A)	503-40	Japan	1940
<i>Pieris floribunda</i> 'Elongata'	183-57	England	1957
" <i>japonica</i> 'Bert Chandler'	1521-66	England	1966
<i>Pinus ayacahuite</i> var. <i>brachycarpa</i>	519-49	Mexico	1949
" <i>cembra</i> 'Columnaris'	978-68	England	1968
" <i>halepensis</i> var. <i>brutia</i>	1148-63	Yugoslavia	1963
" <i>hamata</i>	300-71	Russia	1971
" <i>koraiensis</i> 'Winton'	1795-65	England	1965
" <i>maximartinezii</i>	131-71	England	1971
" <i>mugo</i> 'Kokarde'	490-66	W. Germany	1966
" <i>nigra</i> 'Pygmaea'	824-66	England	1966
" <i>parviflora</i> 'Brevifolia'	366-65	W. Germany	1965
" <i>pumila</i> 'Compacta'	977-68	England	1968
" " 'Dwarf Blue'	409-65	England	1965
" " 'Jermyns'	1794-65	England	1965
" " 'Nana'	976-68	England	1968
" <i>sylvestris</i> 'Compressa' (A)	666-67	England	1967
" " 'Doone Valley'	1000-68	England	1968
<i>Platanus hybrida</i> var. <i>hispanica</i>	561-23	England	1923
" " 'Microvec'	1948-65	Belgium	1965
" " var. <i>parviloba</i>	563-23	England	1923
" <i>orientalis</i> var. <i>insularis</i>	337-39	England	1939
" 'Suttneri'	1984-65	W. Germany	1965
<i>Polygonum aubertii</i>	815-24	England	1924
<i>Populus candicans</i> 'Aurora'	825-66	England	1966
" <i>canescens</i> 'Macrophylla'	340-39	England	1939
" <i>fredroviensis</i>	222-39	Poland	1939
" <i>rogalinensis</i> *	223-39	Poland	1939
" <i>tremula</i>	14352	England	1924
" " 'Erecta'	163-39	Sweden	1939
" " 'Pyramidalis'	829-26	Sweden	1926
<i>Potentilla davurica</i> 'Stocker's Variety'	137-66	England	1966
" <i>frikartii</i> *	390-63	Switzerland	1963
" <i>fruticosa</i> 'Barnbarroch Hybrid' (A)	141-66	England	1966
" " 'Beanii'	141-60	England	1960
" " 'Bowles Variety' (A)	148-66	England	1966
" " 'Buttercup'	2120-65	England	1965
" " 'Clotted Cream'	145-66	England	1966
" " 'Compacta Kornik'	405-66	Poland	1966

Name	Record No.	Country	Year
<i>Potentilla fruticosa</i> 'David Ayling'	134-66	England	1966
" " 'Donard Gold'	138-66	England	1966
" " 'Elizabeth'	611-65	England	1965
" " 'Farreri Prostrata'	343-39	England	1939
" " 'Farrer's White'	366-58	England	1958
" " 'Friesengold'	110-57	W. Germany	1957
" " 'Golden Charm'	146-66	England	1966
" " 'Jackman's Variety'	175-55	England	1955
" " 'Katherine Dykes' (A)	1560-51	England	1951
" " 'Klondike'	140-66	England	1966
" " 'Lady Daresbury'	146-60	England	1960
" " 'Logan' (A)	2123-65	England	1965
" " 'Maanely's' (A)	81-57	Holland	1957
" " 'Minstead Dwarf'	670-65	England	1965
" " 'Moonlight' (A)	1561-51	England	1951
" " 'Nana Argentea'	345-39	England	1939
" " 'Northam' (A)	83-69	England	1969
" " 'Nyewoods'	2126-65	England	1965
" " 'Rhodocalyx'	28-67	England	1967
" " 'Sulfurea'	112-57	W. Germany	1957
" " 'Tangerine'	1064-62	England	1962
" " 'Walton Park'	612-65	England	1965
" " 'What-Not'	136-66	England	1966
" " 'White Rain'	143-66	England	1966
" " 'Woodbridge Gold'	142-66	England	1966
<i>Prunus campanulata</i> 'Plena'	341-49	England	1949
" <i>cerasifera</i> 'Elegans'	1780-25	England	1925
" " 'Fastigiata' (A)	224-39	Poland	1939
" " 'Hessei'	669-36	France	1936
" " 'Nigra'	670-36	France	1936
" " 'Woodii'	162-31	France	1931
" <i>curdica</i>	656-64	Poland	1964
" <i>domestica</i> 'Plantierensis'	614-23	England	1923
" <i>fenzliana</i> (A)	938-27	Tiflis	1927
" <i>gigantea</i> *	1781-25	England	1925
" 'Hally Jolivette'	231-44	Arn. Arb.	1944
" <i>incisa</i> 'Moerheimii'	502-38	Holland	1938
" <i>laurocerasus</i> 'Zabeliana'	404-36	France	1936
" <i>macrocarpa</i> *	932-24	England	1924
" <i>monticola</i>	613-23	England	1923
" <i>padus purdomii</i>	100-24	China	1924
" " 'Watereri'	608-23	England	1923
" <i>persica</i> 'Russell's Red'	230-40	England	1940
" <i>pseudoarmeniaca</i>	804-35	Yugoslavia	1935
" <i>scopulorum</i>	772-38	England	1938
" <i>setulosa</i>	1330-25	China	1925
" <i>spinosa</i> 'Plena'	478-25	England	1925
" <i>subhirtella</i> 'Autumnalis Rosea'	235-40	England	1940
" " 'Pendula' A. J. Ives			
" " selection (A)	514-37	England	1937
" " 'Plena'	255-36	Germany	1936
" " X <i>yedoensis</i> (A)	393-34	England	1934
" <i>tenella</i> 'Alba'	1659-25	England	1925
" <i>tianschanica</i> *	19-71	Russia	1971
" <i>webbii</i>	497-32	Yugoslavia	1932
<i>Ptelea nitens</i> (A)	660-69	Rumania	1960

Name	Record No.	Country	Year
<i>Pterocarya fraxinifolia</i> var. <i>dumosa</i> (A)	348-65	W. Germany	1965
<i>Pyracantha coccinea</i> 'Kasan' (A)	1249-51	Holland	1951
" " 'Orange Giant' (A)	2059-65	Holland	1965
" " 'Orange Glow'	412-65	Holland	1965
<i>Pyronia veitchii</i>	518-37	England	1937
<i>Pyrus salicifolia</i> 'Argentea'	672-36	France	1936
<i>Quercus benderi rubroides</i>	697-65	W. Germany	1965
" <i>borealis maxima</i> 'Aurea'	1985-65	W. Germany	1965
" <i>cerris</i> 'Ambrozyana'	2129-65	England	1965
" <i>coccinea</i> 'Splendens'	147-29	England	1929
" <i>hartwissiana</i> (A)	906-34	Bulgaria	1934
" <i>kewensis</i>	831-38	England	1938
" <i>petraea</i> 'Columna'	413-65	Holland	1965
" <i>pubescens</i> 'Crispata'	59-59	Holland	1959
" <i>velutina</i> var. <i>rubrifolia</i>	765-24	England	1924
<i>Rehderodendron macrocarpum</i>	410-32	China	1932
<i>Rhamnus diamantiaca</i>	603-62	Russia	1962
" <i>petiolaris</i>	1745-25	England	1925
" <i>ussuriensis</i>	1293-71	Russia	1971
<i>Rhododendron brachycarpum</i> var. <i>lutescens</i>	231-27	Scotland	1927
" <i>esetulosum</i>	261-71	Sweden	1971
" <i>hirsutum</i> 'Flore Pleno'	1969-65	England	1965
" <i>hawakamii</i> *	215-70	Formosa	1970
" <i>kotschyi</i>	1625-65	Rumania	1965
" <i>mucronatum</i> 'Lilacinum'	546-65	England	1965
" <i>rufum</i>	189-27	China	1927
" <i>traillianum</i>	258-71	Sweden	1971
" <i>vernicosum</i>	259-71	Sweden	1971
" <i>viscosum rubescens</i>	517-65	England	1965
" 'Ardens'	56-57	England	1957
" 'Ballerina' (A)	537-65	England	1965
" 'Balzac' (A)	1472-60	England	1960
" 'Bartholo Lazzari'	578-52	Holland	1952
" 'Basilisk'	513-65	England	1965
" 'Beaulieu' (A)	533-65	England	1965
" 'Brazil' (A)	1464-60	England	1960
" 'Brides Bouquet'	1920-65	England	1965
" 'Bright Straw'	536-65	England	1965
" 'Caprice'	531-65	England	1965
" 'Cecile'	535-65	England	1965
" 'Col. F. R. Durham'	580-52	Holland	1952
" 'Cunningham's Sulphur'	77-57	England	1957
" 'Daybreak'	1925-65	England	1965
" 'Dr. M. Oosthoek'	582-52	Holland	1952
" 'Edward Henry'	171-57	England	1957
" 'Eisenhower' (A)	314-60	England	1960
" 'Embley Crimson' (A)	545-65	England	1965
" 'Evening Glow'	250-57	England	1957
" 'Exquisita'	173-57	England	1957
" 'F. de Koninck'	174-57	England	1957
" 'Firefly'	540-65	England	1965
" 'Fireglow'	563-65	England	1965
" 'Floradora'	200-57	England	1957
" 'Freya'	532-65	England	1965
" 'Gallipoli'	565-65	England	1965
" 'General Vetter'	668-57	Holland	1957

Name	Record No.	Country	Year
<i>Rhododendron</i> 'Ginger' (A)	1467-60	England	1960
" 'Glowing Embers'	1180-53	England	1953
" 'Goethe'	499-57	England	1957
" 'Gog'	541-65	England	1965
" 'Gold Dust'	1922-65	England	1965
" 'Golden Eye' (A)	1463-60	England	1960
" 'Golden Horn' (A)	1470-60	England	1960
" 'Golden Oriole'	1921-65	England	1965
" 'Golden Sunset' (A)	1179-53	England	1953
" 'Goldsworth Orange'	197-57	England	1957
" 'Grandeur Triumphante' (A)	518-65	England	1965
" 'Gwynnid Lloyd'	1923-65	England	1965
" 'Homebush' (A)	534-65	England	1965
" 'Hotspur' (A)	524-65	England	1965
" 'Hotspur Red'	529-65	England	1965
" 'Hugh Wormald' (A)	528-65	England	1965
" 'Hugo Hardyzer' (A)	1257-50	Holland	1950
" 'J. Jennings' (A)	542-65	England	1965
" 'Joseph Baumann'	587-52	Holland	1952
" 'Kesselringii'	1-69	Denmark	1969
" 'Klondyke' (A)	523-65	England	1965
" 'Knighthood' (A)	514-65	England	1965
" 'Konigin Emma'	588-52	Holland	1952
" 'Koster's Brilliant Red'	591-52	Holland	1952
" 'Magnifica'	176-57	England	1957
" 'Marion Merriman'	1471-60	England	1960
" 'Mathilda'	667-57	Holland	1957
" 'Mrs. Gustave Guillemot'	65-57	England	1957
" 'Nancy Buchanan'	515-65	England	1965
" 'Orient' (A)	1926-65	England	1965
" 'Perfecta'	590-52	Holland	1952
" 'Persil'	530-65	England	1965
" 'President Carnot'	584-52	Holland	1952
" 'Royal Command'	1175-53	England	1953
" 'Royal Lodge' (A)	538-65	England	1965
" 'Samuel Taylor Coleridge' (A)	496-57	England	1957
" 'Satan' (A)	525-65	England	1965
" 'Seville' (A)	527-65	England	1965
" 'Soft Lips'	1927-65	England	1965
" 'Strawberry Ice'	516-65	England	1965
" 'Sugared Almond'	1928-65	England	1965
" 'Surprise'	1929-65	England	1965
" 'Tangiers'	1930-65	England	1965
" 'Tunis' (A)	522-65	England	1965
" 'Volcano' (A)	73-57	England	1957
" 'Von Gneist' (A)	664-57	Holland	1957
" 'Westminster'	526-65	England	1965
" 'Whitethroat'	674-65	England	1965
<i>Ribes dikuscha</i>	1448-66	Russia	1966
" <i>janczewskii</i> (A)	1001-65	Russia	1965
" <i>sanguineum</i> 'Carneum'	1456-51	Holland	1951
<i>Robinia</i> × <i>hillieri</i>	325-53	England	1953
" × <i>holdtii</i> 'Britzensis'	638-65	England	1965
" <i>pseudoacacia</i> 'Coluteoides'	578-65	England	1965
<i>Rosa alba</i> var. <i>incarnata</i>	435-56	England	1956
" " <i>maxima</i>	332-56	England	1956

Name	Record No.	Country	Year
<i>Rosa andersonii</i>	100-36	England	1936
" <i>blochiana</i>	1101-65	Sweden	1965
" <i>calocarpa</i>	2047-25	England	1925
" <i>canina inermis</i>	2083-25	England	1925
" <i>centifolia bullata</i>	110-53	England	1953
" " <i>parvifolia</i> (A)	334-56	England	1956
" <i>ditrichopoda</i> (A)	1102-65	Sweden	1965
" <i>dumalis</i>	854-25	France	1925
" \times <i>dupontii</i>	2085-25	England	1925
" <i>gallica maxima</i>	111-53	England	1953
" <i>giraldii</i>	533-28	Czechoslovakia	1928
" <i>kochiana</i>	776-25	Ireland	1925
" <i>marcyana</i>	900-25	Denmark	1925
" <i>moyesii</i> 'Geranium' (A)	21-52	England	1952
" " 'Nevada' (A)	336-56	England	1956
" " 'Underway' (A)	22-52	England	1952
" <i>multiflora thunbergiana</i>	2075-25	England	1925
" <i>omeiensis</i> 'Astrosanguinea'	2077-25	England	1925
" " <i>polyphylla</i>	528-37	England	1937
" <i>pendulina</i> 'Flore Plena'	125-53	England	1953
" <i>pteragonis</i> 'Redwing' (A)	1425-51	Holland	1951
" <i>roopae</i> (A)	821-60	Czechoslovakia	1960
" <i>scharnkeana</i> (A)	114-66	Holland	1966
" \times <i>wintoniensis</i>	297-36	England	1936
<i>Rubus</i> \times <i>fraseri</i> (A)	2137-65	England	1965
" <i>nemorosus</i>	2032-25	England	1925
" <i>spectabilis</i> 'Flore Plena' (A)	99-66	Scotland	1966
" \times <i>tridel</i> 'Benenden Beauty' (A)	96-66	Scotland	1966
<i>Salix aegyptiaca</i>	534-33	Sweden	1933
" 'Aglaiia'	663-71	Belgium	1971
" <i>alpigena</i>	585-23	England	1923
" <i>argophylla</i>	2038-65	France	1965
" <i>argyracea</i> (A)	357-67	Sweden	1967
" <i>canariensis</i>	528-33	Germany	1933
" <i>caspiica</i> (A)	434-62	Czechoslovakia	1962
" <i>chlorostachya</i>	359-67	Sweden	1967
" <i>eriocephala</i>	465-33	Germany	1933
" <i>friesiana</i>	308-60	Czechoslovakia	1960
" <i>glabra</i>	480-33	Germany	1933
" <i>grandifolia</i> (A)	482-33	Germany	1933
" <i>hegetschweileri</i>	152-67	Sweden	1967
" <i>kangensis</i>	704-71	Belgium	1971
" <i>koriyanagi</i>	157-67	Sweden	1967
" <i>lasiogyne</i> (A)	2036-65	France	1965
" <i>lasiolepis</i>	2037-65	France	1965
" <i>matsudana</i> 'Pendula'	457-23	China	1923
" " 'Tortuosa'	458-23	China	1923
" <i>melanostachys</i> (A)	656-71	Belgium	1971
" <i>microstachys</i>	437-62	Czechoslovakia	1962
" <i>muscina</i> (A)	670-71	Belgium	1971
" <i>myrsinites jacquiniana</i>	898-60	Czechoslovakia	1960
" <i>nigra falcata</i>	2170-25	England	1925
" <i>purpurea itrenta</i>	662-71	Belgium	1971
" <i>retusa vitaibeliana</i>	899-60	Czechoslovakia	1960
" <i>rorida</i>	153-67	Sweden	1967
" <i>rutiliana</i> * (A)	411-66	Poland	1966

Name	Record No.	Country	Year
<i>Salix sendaica</i>	435-62	Czechoslovakia	1962
" <i>siebertii</i> (A)	689-71	Belgium	1971
" <i>songarica</i> (A)	392-66	Poland	1966
" <i>turanica</i>	433-62	Czechoslovakia	1962
" <i>wardiana</i>	2179-25	England	1925
" <i>viminialis</i> 'Continental' (A)	404-66	Poland	1966
" " 'Longifolia' (A)	407-66	Poland	1966
" <i>waldsteiniana</i>	150-67	Sweden	1967
" <i>zatugensis</i> * (A)	672-67	England	1967
<i>Sambucus koreana</i> *	415-66	Poland	1966
" <i>latipinna</i>	731-64	Latvia	1964
" <i>nigra</i> 'Rosea Plena'	505-41	England	1941
" <i>racemosa</i> 'Laciniata Aurea'	356-39	England	1939
" <i>tigranii</i> *	1097-65	Sweden	1965
" 'Fruhe Barmstedterin' (A)	127-65	W. Germany	1965
<i>Schisandra repanda</i>	552-71	Japan	1971
<i>Schizophragma hydrangeoides</i> 'Roseum'	37-67	England	1967
<i>Sinojackia rhederiana</i>	1318-30	China	1930
<i>Sophora aubia</i> *	435-63	Thailand	1963
" <i>microphylla</i>	1085-69	New Zealand	1969
" <i>japonica</i> 'Alba Variegata' (A)	193-68	England	1968
" " 'Variegata'	157-66	England	1966
<i>Sorbaria grandiflora</i>	696-25	France	1925
" <i>kirilowi</i>	428-30	China	1930
" <i>tobolskiana</i> *	394-66	Poland	1966
<i>Sorbus amelosorbus</i>	1242-51	Holland	1951
" <i>aria</i> 'Majestica' (A)	1475-51	England	1951
" <i>aucuparia</i> 'Backhousei'	1806-25	England	1925
" " 'Dirkenii'	1807-25	England	1925
" " 'Praemorsa'	753-65	France	1965
" " 'Pendula Variegata' (A)	488-65	Holland	1965
" " 'Rowancroft Pink Coral' (A)	1154-65	Holland	1965
" " 'Sheerwater Seedling' (A)	490-65	Holland	1965
" <i>bakonyensis</i>	329-69	Holland	1969
" <i>caucasica</i>	1296-71	Russia	1971
" <i>decora</i> 'Nana' (A)	501-57	England	1957
" <i>devoniensis</i>	646-64	Ireland	1964
" <i>esserteauana</i> 'Flava'	680-65	England	1965
" <i>gayeriana</i>	1313-70	Holland	1970
" <i>glabrata</i>	815-38	England	1938
" <i>harrowiana</i>	283-59	England	1959
" × <i>hybrida</i> 'Gibbsii'	645-25	England	1925
" <i>insignis</i>	682-65	England	1965
" <i>intermedia</i> var. <i>arranensis</i> (A)	1534-51	England	1951
" <i>lancifolia</i> (A)	1106-65	Sweden	1965
" <i>latifolia subcuneata</i>	826-38	England	1938
" <i>norvegica</i>	1108-65	Sweden	1965
" <i>oligodonta</i>	142-34	China	1934
" <i>pluripinnata</i>	243-40	England	1940
" <i>pseudovertesensis</i>	1314-70	Holland	1970
" <i>prattii</i> var. <i>subarachnoides</i>	467-24	England	1924
" " <i>tatsiensis</i>	149-34	China	1934
" <i>reducta</i>	1345-51	England	1951
" <i>ramnoides</i>	780-38	England	1938
" <i>sargentiana warleyensis</i>	115-62	England	1962
" <i>schneideriana</i>	170-65	Russia	1965

Name	Record No.	Country	Year
<i>Sorbus simonkaina</i>	173-66	Holland	1966
" <i>sognensis</i> *	1111-65	Sweden	1965
" <i>subarranensis</i> *	1112-65	Sweden	1965
" <i>subpinnata</i>	720-25	Sweden	1925
" <i>subsimilis</i>	350-59	Sweden	1959
" × <i>thuringiaca</i>	1812-25	England	1925
" × " 'Fastigiata'	513-27	England	1927
" <i>umbellata</i>	41-23	Scotland	1923
" × <i>vagensis</i>	820-38	England	1938
" 'Hilling's Spire' (A)	284-64	England	1964
" 'Joseph Rock'	683-65	England	1965
" 'Maidenblush' (A)	415-65	Holland	1965
" 'Meinichii' (A)	681-65	England	1965
" 'Old Pink'	416-65	Holland	1965
" 'Scarlet King' (A)	417-65	Holland	1965
" 'Wilfrid Fox' (A)	687-65	England	1965
<i>Spiraea</i> × <i>arguta</i> 'Compacta'	1255-51	Holland	1951
" × " 'Graffsheim'	368-65	W. Germany	1965
" × " 'Grestenii'	418-65	Holland	1965
" × <i>bumalda alba</i>	675-36	France	1936
" <i>canescens glaucophylla</i>	363-39	England	1939
" <i>concinna</i>	1979-25	England	1925
" <i>difformis</i>	1980-25	England	1925
" <i>fontenaysii</i> 'Rosea' (A)	14-66	W. Germany	1966
" <i>gieseleriana</i>	1981-25	England	1925
" <i>humilis</i> (A)	1005-65	Russia	1965
" <i>media glabrescens</i> (A)	2154-65	England	1965
" <i>nipponica tosaensis</i> (A)	688-65	England	1965
" <i>nivea</i> 'Alba-Rosea'	718-65	W. Germany	1965
" <i>notha superlatifolia</i>	491-36	W. Germany	1936
" <i>polonica</i> *	398-66	Poland	1966
" <i>pulchella</i>	1987-25	England	1925
" <i>rosthornii</i>	413-66	Poland	1966
" <i>semplicna</i> *	22-66	W. Germany	1966
<i>Staphylea colchica</i> 'Coulombieri Fastigiata' (A)	480-65	W. Germany	1965
" " <i>kochiana</i> (A)	557-65	England	1965
<i>Stravaesia davidiana salicifolia</i>	877-63	France	1963
<i>Styrax japonica fargesii</i>	156-34	France	1923
<i>Symphoricarpos albus nanus</i>	650-56	Holland	1956
" × <i>chenaultii</i> 'Erecta'	614-52	Holland	1952
" × <i>doorenbosii</i>	670-56	Holland	1956
" <i>orbiculatus</i> 'Variegatus'	317-56	England	1956
" 'Mother of Pearl'	673-56	Holland	1956
<i>Syringa</i> × <i>henryi</i> 'Alba'	512-36	France	1936
" × <i>nanceiana</i> 'Floreale' (A)	1729-25	France	1925
" × " 'Rutilant' (A)	23-32	France	1932
" <i>rhodopea</i>	453-33	Germany	1933
" × <i>swegiflexa</i>	701-36	Germany	1936
" <i>tomentella rosea</i>	1576-51	England	1951
" <i>velutina</i> 'Excellens' (A)	24-32	France	1932
" <i>yunnanensis</i> 'Rosea' (A)	1578-51	England	1951
" 'Abundance'	287-68	Russia	1968
" 'Alexey Maressyev'	286-63	Russia	1963
" 'Alphonse Bouvier' (A)	391-59	W. Germany	1959
" 'Candeur'	30-32	France	1932
" 'Capitan Gastello' (A)	186-67	Russia	1967

Name	Record No.	Country	Year
<i>Syringa</i> 'Comte Adrien de Montebello' (A)	281-63	England	1963
" 'Fraicheur'	1102-67	Holland	1967
" 'Franz Chopin'	1104-67	Holland	1967
" 'G. J. Baardse'	1156-65	Holland	1965
" 'Galina Ulanova' (A)	180-67	Russia	1967
" 'Gortensia' (A)	176-67	Russia	1967
" 'Herman Eilers'	1099-67	Holland	1967
" 'India'	174-67	Russia	1967
" 'I. V. Michurin' (A)	175-67	Russia	1967
" 'Izobilije' (Plenty)	190-67	Russia	1967
" 'K.A. Timeryazen' (A)	189-67	Russia	1967
" 'Kapriz'	182-67	Russia	1967
" 'Krasavitsa Moskv'y'	177-67	Russia	1967
" 'Leonid Leonow'	172-67	Russia	1967
" 'Lights of Donbase'	290-68	Russia	1968
" 'Luminifera'	2156-65	England	1965
" 'Marengo' (A)	41-32	France	1932
" 'Maud Notcutt' (A)	1586-65	England	1965
" 'M. I. Kalinin'	291-68	Russia	1968
" 'Makowickii' (A)	1098-67	Holland	1967
" 'Margot Gruenwald'	1100-67	Holland	1967
" 'Marshall Vasilesky' (A)	181-67	Russia	1967
" 'Metschta' (A)	192-67	Russia	1967
" 'Montesquieu' (A)	42-32	France	1932
" 'Mrs. H. J. Cran'	1101-67	Holland	1967
" 'Niebo Moskv'y' (A)	185-67	Russia	1967
" 'Olimpiada Koliesnikova' (A)	187-67	Russia	1967
" 'Pol Robson'	184-67	Russia	1967
" 'Pioneer' (A)	183-67	Russia	1967
" 'Prairial'	513-36	France	1936
" 'President Lebrun' (A)	679-36	France	1936
" 'Prodige' (A)	45-32	France	1932
" 'Prof. Edmund Jankowski'	1105-67	Holland	1967
" 'Puritan' (A)	1373-63	England	1963
" 'Russkaya Krasavitsa' (A)	193-67	Russia	1967
" 'Savonarole'	518-36	France	1936
" 'Savoyer'	1103-67	Holland	1967
" 'Souvenir de Claudius Graindorge' (A)	680-36	France	1936
" 'Sovietskaia Arktika'	191-67	Russia	1967
" 'Stefan Makowiecki'	309-66	Belgium	1966
" 'Sumierki' (A)	173-67	Russia	1967
" 'Tankman' (A)	289-68	Russia	1968
" 'Zarya Kommunizma'	178-67	Russia	1967
" 'Znamya Lenyna' (A)	179-67	Russia	1967
<i>Tamarix tetrandra</i>	1972-25	England	1925
<i>Taxus baccata</i> 'Adpressa Stricta'	694-36	Germany	1936
" " 'Cavendishii'	1024-38	England	1938
" " 'Columnaris Suecica'	820-58	Sweden	1958
" " 'Hessei'	695-36	Germany	1936
" " 'Omberg' (A)	819-58	Sweden	1958
<i>Thuja occidentalis</i> 'Indomitabile' (A)	1797-65	England	1965
" " 'Tetragona'	1085-68	England	1968
" " 'Wanadyke Silver'	1088-68	England	1968
" <i>plicata</i> 'Cuprea'	689-65	England	1965
" " 'Hillieri'	194-32	England	1926
" " 'Semperaeusces' (A)	617-65	England	1965

Name	Record No.	Country	Year
<i>Thuja plicata variegata</i>	465-59	England	1959
<i>Tilia cordata ascidiata</i> (A)	272-38	Holland	1938
" " 'Handsworth' (A)	653-52	England	1952
" " major	709-52	England	1952
" × <i>europaea</i> 'Corallina'	436-56	England	1956
" × " 'Longevirens' (A)	214-66	Holland	1966
" × " 'Pendula'	130-55	England	1955
" × " 'Wratislaviensis' (A)	485-65	Holland	1965
" <i>flaccida diversifolia</i>	305-66	Belgium	1966
" <i>hillieri</i> * (A)	2159-65	England	1965
" <i>platyphyllos</i> 'Aurea'	1739-25	England	1925
" " 'Begoniaefolia' (A)	655-52	England	1952
" " 'Compacta' (A)	195-66	Holland	1966
" " <i>grandifolia</i>	161-71	Rumania	1971
" " 'Pyramidalis Aurea'	711-52	England	1952
" <i>tomentosa abundantiflora</i>	162-71	Rumania	1971
" " <i>horizontalis</i>	1742-25	England	1925
" " <i>inaequalis</i>	163-71	Rumania	1971
" " <i>parvifrons</i>	165-71	Rumania	1971
" " <i>platyspatha</i>	164-71	Rumania	1971
<i>Torreya fruticosa</i>	504-40	Japan	1940
<i>Tsuga canadensis</i> 'Horsford'	1804-65	England	1965
<i>Ulmus pumila</i> 'Ansalconi' (A)	636-61	Italy	1961
<i>Vaccinium corymbosum</i> 'Goldtraube'	118-57	W. Germany	1957
" <i>cylindraceum</i>	296-59	England	1959
" <i>glaucoalbum</i>	86-25	Germany	1925
" <i>kansaiense</i>	874-60	Japan	1960
" <i>simulatum</i>	211-68	England	1925
" <i>versicolor</i>	1075-57	Japan	1957
<i>Viburnum awabuki</i>	699-63	Japan	1963
" × <i>bodnantense</i>	360-49	England	1949
" " 'Dawn'	1157-65	Holland	1965
" " 'Deben'	530-60	England	1960
" " 'Splendens'	643-61	England	1961
" <i>breviplex</i>	19354	England	1925
" <i>carlesii</i> 'Aurora'	2163-65	England	1965
" <i>cassinoides</i> 'Nanum' (A)	1581-51	England	1951
" <i>dauidii</i> <i>foemina</i>	506-63	Scotland	1963
" <i>erubescens</i> f. <i>gracilipes</i>	349-49	England	1949
" <i>farreri</i> 'Album' (A)	1266-51	Holland	1951
" " 'Bowles Variety' (A)	429-52	Ireland	1952
" " 'Candidissimum'	551-37	England	1937
" " 'Compactum'	552-37	England	1937
" " 'Nanum' (A)	1267-51	Holland	1951
" <i>flavescens</i>	518-63	Scotland	1963
" <i>grandiflorum koreanum</i>	509-63	Scotland	1963
" × <i>hillieri</i>	166-57	England	1957
" × " 'Winton'	194-57	England	1957
" × <i>juddii</i> × <i>carlesii</i>	810-34	Arn. Arb.	1934
" <i>kornicense</i> *	417-66	Poland	1966
" <i>lantana</i> 'Lees'	706-52	England	1952
" " 'Variegatum'	438-59	Holland	1959
" <i>opulus</i> 'Notcutt's Variety' (A)	814-38	England	1938
" <i>plicatum</i> 'Mariesii' (A)	1871-25	England	1925
" × <i>rhytidocarpum</i> (A)	412-36	France	1936
" × <i>rhytidophyllum</i> 'Roseum' (A)	510-41	England	1941

Name	Record No.	Country	Year
<i>Viburnum rigidum</i>	1007-65	Russia	1965
" <i>sieboldii reticulatum</i>	2046-65	France	1965
" <i>sympodiale</i> (A)	529-63	Scotland	1963
" <i>zamoykianum</i> *	396-66	Poland	1966
" 'Anne Russell'	2162-65	England	1965
" 'Park Farm Hybrid'	343-49	England	1949
<i>Vinca minor</i> 'Azurea'	476-23	England	1923
<i>Weigela</i> 'Aldenham Glow'	521-52	England	1952
" 'Buisson Fleuri' (A)	567-65	England	1965
" 'Descartes'	582-36	England	1936
" 'Eva Supreme' (A)	42-65	Holland	1965
" 'Feerie'	1718-25	France	1925
" 'Ideal' (A)	16-32	France	1932
" 'Looymansii Aurea'	410-60	England	1960
" 'Majestueux' (A)	17-32	France	1932
" 'Nivalis' (A)	44-65	Holland	1965
" 'Perle'	1586-51	England	1951
" 'Saturn'	231-60	Denmark	1960
" <i>wagneri</i>	646-60	France	1960
<i>Zanthoxylum ailanthoides</i>	1612-65	Japan	1965
" <i>alatum subtrifoliatum</i>	811-70	France	1970
" <i>rhoifolium</i>	757-65	W. Germany	1965
<i>Zelkova serrata</i> 'Variegata' (A)	674-67	England	1967



Unusual and Mysterious: The Black Pussy Willow

by RICHARD E. WEAVER, JR.

The Arnold Arboretum's next biennial plant dividend to our Friends will be a rooted cutting of *Salix melanostachys*, the Black Pussy Willow. We have always tried to offer plants that are both desirable and unusual, and this year's choice is no exception. The Black Pussy Willow is a most unusual plant in several respects. First, its origin is unknown and its exact classification is a matter of debate. It has been cultivated by the Japanese for years, but the plant is not known in the wild. Only a single clone exists, and this consists strictly of male plants. Therefore the status of *S. melanostachys* as a distinct species is thrown into considerable doubt. It has been classified as a variety of *S. gracilistyla*, but it differs from that very beautiful Japanese species in a number of important technical characteristics (e.g., non-silky catkins, hairless twigs, shorter scales, etc.) The Black Pussy Willow most likely arose as a hybrid between several willow species. It probably should be called by a cultivar name, and there are several Japanese ones available, but that will be for a willow specialist to decide.

The second unusual aspect of the Black Pussy Willow is the color of its catkins ("pussies"). Black is essentially nonexistent in the plant world. The very few so-called black flowers or other plant structures are invariably very dark shades of red and purple. So it is with *Salix melanostachys* (the species named from the Greek *melano*, meaning very dark, and *stachys* meaning spike or catkin.) The scales of the catkins are a very dark red-purple, beautifully contrasting with the brick-red anthers that turn to yellow as they mature. But do not expect the gigantic catkins seen on sprays of Pussy Willow sold in florist shops. The "pussies" of *S. melanostachys* are rather small, but they are profusely produced, and they are set on reddish twigs.

When your plant arrives, hopefully in April 1978, plant it outdoors, either in a nursery area or in its permanent place in your garden. Small as it may seem to be, it will grow quickly. Perhaps you should soak its roots in water for a few hours before planting, and surely protect it with stakes or chicken wire from lawn mowers and erring feet. Do not take pity on its small size and try to keep it indoors.

Now a few tips for siting and maintenance: (1) Willows tolerate or even prefer moist or soggy soil, but most, including *Salix melano-*

stachys, will do quite well in a drier, but not parched, situation. (2) The more sun the plant receives, the more compactly it will grow, and the more catkins it will produce. It will do reasonably well in partial shade, however. (3) The plant will grow to be a bushy shrub about 10 feet in height and spread. For a few years it may be a bit spindly, so judicious pruning may be required. (4) The catkins appear in early to mid-March, while the yellow, red, or copper flowers of the Witch Hazel, *Hamamelis* \times *intermedia*, are still in good shape, or while the flowers of the Cornelian Cherries, *Cornus mas* and *C. officinalis* are beginning to show color. Siting the Black Pussy Willow against any of these would produce a striking contrast.

The Black Pussy Willow is still rare in the United States. Our original stock was received in 1971 from the Kalmthout Arboretum in Belgium. Enjoy your plant, nurture it, and share it with friends. Cuttings root easily at nearly any time of year.



Collecting Expedition to Japan and Korea

by STEPHEN A. SPONGBERG and RICHARD E. WEAVER, JR.

Why send two of the Arnold Arboretum's staff members on a seed-collecting expedition to Japan and The Republic of Korea? The flora of the former country is about as well catalogued as that of any in the world; most of its outstanding ornamental woody plants are already in cultivation in the West; and several other American arboreta and botanic gardens have recently sponsored collecting expeditions to Japan.

These facts notwithstanding, there are several very good reasons why we embarked with enthusiasm and high expectations on September 1, 1977 for a six-week collecting trip marked by international goodwill and several botanical surprises. First, the Arnold Arboretum was the leader among American institutions in exploring the flora of temperate Asia, yet it had not sent an expedition since E. H. Wilson returned from Japan and Korea in 1918. The time was certainly due for the Arboretum to re-establish its contacts and interests in that part of the world. Second, many of Japan's fine ornamentals are represented in Western horticulture by relatively few original collections — collections that often were made in warmer parts of the country and the resulting plants are not reliably hardy in the northern United States. Could not collections of these same plants from areas with more rigorous climates increase the hardiness range of some fine ornamentals? Third, collections from wild sources, with minimal chances of being hybrids, are valuable for botanical study. And finally, Korea has been largely neglected by American plant explorers, yet in its flora are many plants otherwise known only from China (at present still inaccessible to us) and its climate is in some places more rigorous than that of much of New England.

The first week and a half of collecting were spent on Hokkaido, where our itinerary had been largely arranged by Dr. Tadao Ui, Director of the Botanic Garden of the Faculty of Agriculture of Hokkaido University in Sapporo. We were accompanied by Dr. Katsuhiko Kondo of Hiroshima University, and received support from many Japanese officials. The northernmost of Japan's four major islands, Hokkaido lies approximately between 41 and 45 degrees North Latitude, more or less equivalent to that of New England from southern



Cryptomeria japonica grove on the western, Japan Sea slope of Honshu at Yamadera. Trees in this area exceeded 100 feet in height. Photo: S. Spongberg.

Connecticut to central Maine. Collecting was concentrated in southern Hokkaido where the woody flora is particularly rich, this area being the meeting ground for both temperate and boreal elements. In one small area near Sapporo, the prefectural capital, 108 species of trees are native, the highest concentration in all of the North Temperate Zone. There, two broad-leaved evergreens of considerable ornamental value, *Skimmia japonica* and *Daphniphyllum macropodum* var. *humile*, were collected near the northern limit of their ranges.

With the help of Mr. Yojuuro Sato, a short excursion was made into central Hokkaido, where the temperature has gone as low as -40°C . Exciting collections in the lowland forest of this region included *Alangium platanifolium* var. *trilobum* and *Cephalotaxus harringtonia* var. *nana*, probably the northernmost representatives of these plants ever introduced into the United States. The primary objective in central Hokkaido was Mt. Daisetsu, a volcanic massif with still active vents and a very extensive alpine zone. At 2345 meters it is the highest point on the island. The alpine flora there is characterized by a great diversity of shrublets including species of *Rhododendron*, *Vaccinium*, *Empetrum*, *Loiseluria*, and *Sieversia*, a woody relative of *Geum*.

The second major portion of the trip was spent in the northern district of Honshu, the main Japanese island. Here we were accompanied by Dr. Kankichi Sohma, a palynologist from Tohoku University in Sendai, who is well versed in the Japanese flora, and one of his graduate students, Mr. Masamichi Takahashi. Collecting was concentrated on the higher mountains of the district, including: the volcanic Mt. Hakkoda, where *Abies mariesii* and *Tsuga diversifolia* were found at their northernmost stations, and seeds were collected from a dwarf *Hamamelis japonica*; the predominantly serpentine Mt. Hayachine where the most exciting finds were *Betula corylifolia* and *Acer distylum*, a maple with leaves like those of a linden; and the mountains of Nikko National Park where *Trochodendron aralioides*, a primitive evergreen tree, was collected near its northern limit at an elevation of 1000 meters.

In Korea, Mr. Carl Ferris Miller was our host. Several profitable days were spent in Mr. Miller's Chollipo Arboretum on the western coast of Korea south of Seoul, and nearby, seeds of *Koelreuteria paniculata*, the Golden Rain Tree, were collected from one of the two localities where the species is known in Korea. A stop at an old garden on the way back to Seoul yielded one of the trip's major surprises — a fine specimen, in fruit, of *Magnolia officinalis*, the Chinese Umbrella Magnolia, a species very rare in cultivation in the West.

Perhaps the most exciting excursion in Korea was to some of the higher mountains in the northeastern part of the country. Temperatures in this region fell to -30°C . during the winter of 1976-1977, so most of the plants growing there should be hardy at the Arnold Arboretum. Notable collections included *Magnolia sieboldii*, *Paulownia*

coreana, *Diospyros kaki*, the Oriental Persimmon, and *Sapium japonicum*, a small tree in the Euphorbia Family with beautiful autumn coloration, and one that is not even mentioned in Alfred Rehder's *Manual of Cultivated Trees and Shrubs*.

A total of 505 collections were made, representing 327 taxa in 69 families. Included were fifteen species of maple, nine of birch, five of alder (some of which are very beautiful trees), nine of viburnum, six of euonymus, and five of magnolia. With the exception of a single package, of which there fortunately was a duplicate, all of the material arrived safely at the Arnold Arboretum and is now being processed at the Dana Greenhouses. Eventually, representatives will be added to the living collections of the Arnold Arboretum, bolstering our already impressive collection of Oriental plants; others will be used for staff research projects, and the excess will be distributed to other arboreta and botanic gardens.

A future issue of *Arnoldia* will feature a full length article detailing more fully the itinerary, the plants collected, and the people met en route.



Fruit aggregates of *Magnolia hypoleuca*, Japanese White Bark Magnolia, collected on Mt. Hayama in the Yamadera region. Photo: S. Spongberg.



Concord Areas Trees. Ray Angelo. Bedford, Mass.: Concord Field Station. 39 pages, illustrated. \$1.50.

This is an attractive booklet for the identification of tree species growing wild in the area of Massachusetts' Concord Field Station. The instructions for the use of the guide suggest obtaining tree fruits, if these are available, and matching them against the 43 illustrations. Page references then refer the reader to species grouped according to leaf characteristics: needle- or scale-like, alternate or opposite, simple or compound. Within these categories, leaf drawings offer a further aid to identification, aided by brief descriptions of the plants, their habitats and their common and scientific names. A bibliography suggests both popular and technical volumes for further study. This book will serve well as a primer for students and visitors to the Concord area.

RICHARD A. HOWARD

Mille et Un Livres Botaniques, Répertoire Bibliographique de la Bibliothèque Arpad Plesch. Bruxelles: Arcade. 517 pages, 34 colored plates, 36 black and white illustrations. Belgian francs 3900.

This handsomely produced volume is the second catalogue of the botanical and horticultural library of the late Dr. Arpad Plesch (1890-1974) who in 1939 established an experimental garden on the French Riviera, a garden whose aim, he said, was "... to enrich the flora of Europe by the introduction and acclimation of new tropical plants..." The first catalogue was prepared in 1954 by Jacques Pley: *Bibliothèque Arpad Plesch La Leonina I. Botanique*. The present catalogue was compiled by Henry-Pierre Gourry.

The catalogue provides complete bibliographic descriptions of many more than the "mille et un livres" of the title, with annotations culled from many sources, but notably from the *Catalogue of Botanical Books in the Collection of Rachel MacMasters Miller Hunt*, as well as Blunt's *The Art of Botanical Illustration* and Nissen's *Die botanische Buchillustration*.

An overview of botanical literature in French and English, from its beginnings through the nineteenth century, is provided in the form of an introductory essay that would have been more helpful had the accompanying black and white illustrations followed the text more closely. The English rendering is marred for the English speaking reader by numerous infelicities of translation. The annotations in the catalogue itself, when from a source other than French, are sometimes attributed, sometimes not; sometimes set apart by quotation marks, sometimes in italics. This lack of uniformity of style is disturbing, and means that the reader must seek out the original annotation. The introductory essay is followed by an alphabetical list of the authors and main works, "from the origins to the nineteenth century," although the entire work is itself a dictionary catalogue, including, it must be said, some twentieth century titles.

There are numerous indices: principal illustrators, a topical subject index, Latin names of cities, and an index of Latin abbreviations and their meanings in German, French and English, to mention but a few. A useful

table of eighteenth century paper sizes (taken from the Hunt catalogue) is given, as is an explanation of the calendar of the French Republic. The generous indexing, however, inspires little confidence — a fault of poor proofreading that let stand such barbarisms as Goëbel for Goebel; as well as Goëthe and Gœthe for Goethe.

The Plesch collection as represented by this catalogue no longer exists. The collection was sold at auction by Sotheby's in three sales: June 16-17 and November 17-18, 1975, and March 15-16, 1976. For that reason, if for no other, the catalogue is valuable as a source of reference for the many rare or unique items and the interesting bindings and association copies. It is, however, a source to be consulted with some reservations in view of the many flaws in its execution. It will be most helpful if used in conjunction with the authoritative Hunt catalogue, and, for English botanical and horticultural literature, the recent superb volumes by Blanche Henrey. For works unique to the Plesch Collection, the present volume will serve if used with the Sotheby sales catalogue (3 volumes, 1975-1976) which provides a useful index of provenance.

The book itself, although attractively bound with slip case, is supported in the binding by the paste-down endpapers alone, and will not serve for long without strengthening at the hinges. It is to be hoped that the copies printed on rag paper and bound in full leather will be a more lasting memorial to Dr. Plesch.

LENORE M. DICKINSON

A History of the Orchid. Merle A. Reinikka. Coral Gables, Fla.: University of Miami Press. 316 pages, black and white illustrations. \$15.00.

Orchids were first named when Theophrastus, writing in the fourth century B.C., spoke of their medicinal properties. It was not until the seventeenth century that Europeans began to enjoy them for their beauty, though in the Orient they had been admired for their scent since the time of Confucius. In the nineteenth century, an orchid mania struck England. The sixth Duke of Devonshire paid one hundred guineas for a white Philippine *Phalaenopsis*, while particularly rare specimens commanded up to seven hundred pounds. Today, orchid societies draw as many as 1,500 members to their meetings, and the classification and hybridization of these lovely plants is a continuing challenge.

A prodigious amount of research has gone into this history of the orchid. The author states that with the amount of material he had accumulated he could have written an entire encyclopedia on orchidology. His first section deals with the history, cultivation, and scientific application of orchids and includes a guide to orchid literature. The second section comprises short biographies of the leading figures in orchid history, from Linnaeus to Oakes Ames.

This is a book that should be of great interest to orchid growers, though its specialization will not appeal to a wider public.

CORA WARREN

American Gardens in the Eighteenth Century "For Use or For Delight." Ann Leighton. Boston, Mass.: Houghton Mifflin Company. 514 pages; illustrated. \$17.50 hardcover.

When, in 1970, Ann Leighton published *Early American Gardens*, Walter Muir Whitehill, in an enthusiastic review, exclaimed, "What a perfectly enchanting book!" This present volume surpasses even Mr. Whitehill's encomiums.

A most impressive amount of research has been done, and this is presented in a witty and charming manner. Contemporary sources are copiously quoted on every aspect of both English and American gardening of the period, with an imaginative selection of eighteenth century prints scattered throughout the clear and comprehensive text.

The book begins with chapters on the history of the horticultural development of the Southern and Northern states and continues with detailed accounts of husbandry, naturalists' and botanists' and nurserymen's lists. The correspondence and the records of seed and plant exchanges that took place among such eminent people as Washington, Jefferson, Bartram, Collinson and many others make fascinating reading. There are chapters on medicines, the changing style in gardens (from formal to natural), and chapters on vegetables, fruits and flowers with contemporary, annotated lists of those grown.

There is a 104-page index of the plants most frequently cultivated in eighteenth century gardens with many indigenous flowers added to the list. Each plant is identified by its correct botanical name, and the majority are accompanied by encapsulated accounts of eighteenth century comments on them.

For those interested in horticulture this is a book through which it is a joy to browse. The historian will find a refreshing new approach to America's beginnings, and for those who wish to restore an eighteenth century garden to its original aspects, this work is an essential tool.

CORA WARREN





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1. TITLE OF PUBLICATION ARNOLDIA		2. DATE OF FILING Sept. 26, 1977	
3. FREQUENCY OF ISSUE BI-MONTHLY	A. NO. OF ISSUES PUBLISHED ANNUALLY 6	B. ANNUAL SUBSCRIPTION PRICE \$8.00	
4. LOCATION OF KNOWN OFFICE OF PUBLICATION (Street, City, County, State and ZIP Code) (Not printers) ARBORWAY, JAMAICA PLAIN, MASSACHUSETTS 02130			
5. LOCATION OF THE HEADQUARTERS OR GENERAL BUSINESS OFFICES OF THE PUBLISHERS (Not printers) ARBORWAY, JAMAICA PLAIN, MASSACHUSETTS 02130			
6. NAMES AND COMPLETE ADDRESSES OF PUBLISHER, EDITOR, AND MANAGING EDITOR			
PUBLISHER (Name and Address) THE ARNOLD ARBORETUM OF HARVARD UNIVERSITY, ARBORWAY, JAMAICA PLAIN, MASS. 02130			
EDITOR (Name and Address) JEANNE S. WADLEIGH, ARNOLD ARBORETUM, ARBORWAY, JAMAICA PLAIN, MASSACHUSETTS 02130			
MANAGING EDITOR (Name and Address)			
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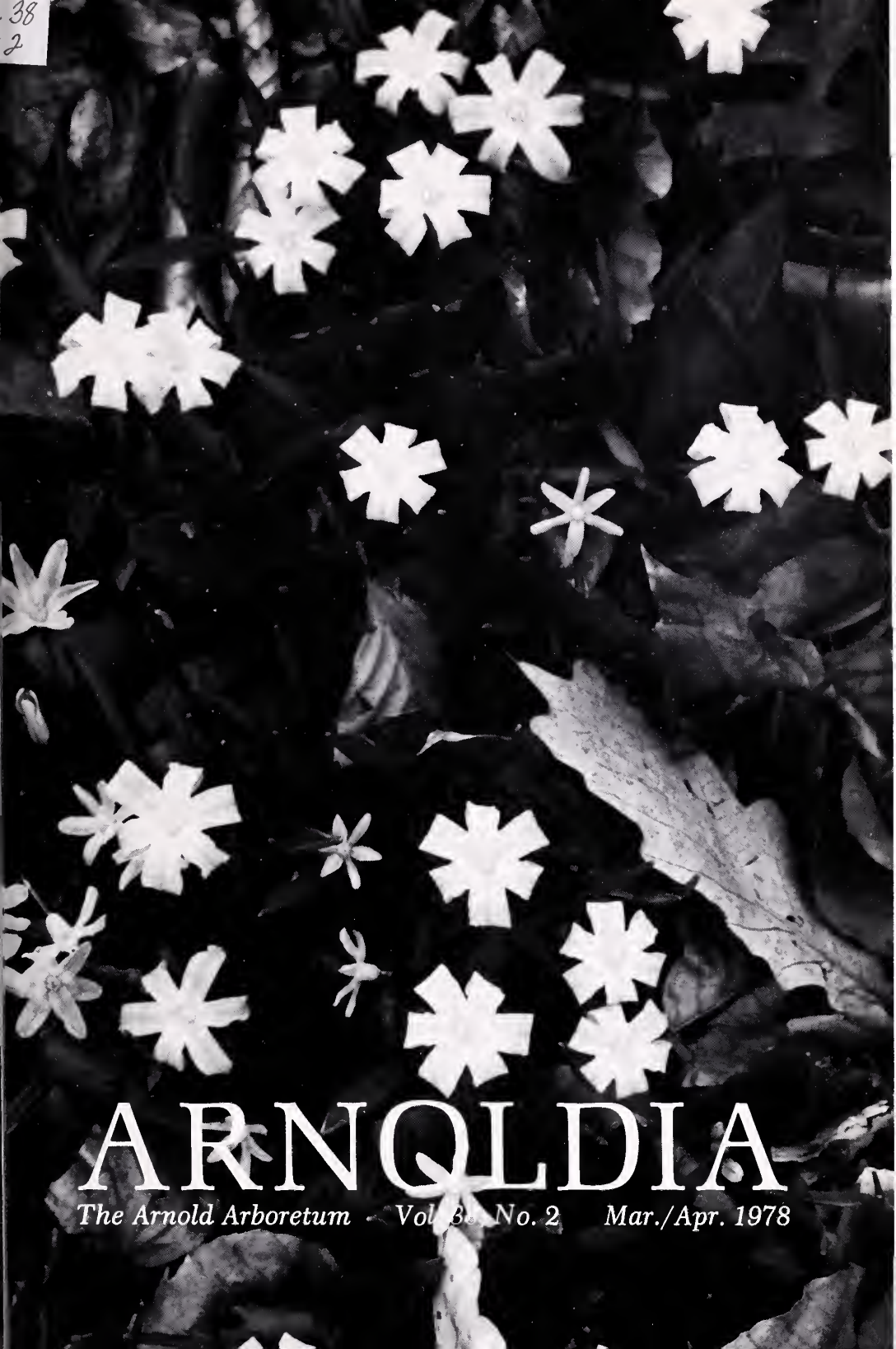
Shad or Serviceberry (*Amelanchier canadensis*). Photo: A. Bussewitz. Photographs by Alfred Bussewitz in this issue appeared in "Bark Is Beautiful," an exhibit of his work that was featured at the Arnold Arboretum last winter. Mr. Bussewitz has recently retired as Director of the Massachusetts Audubon Society's Rocky Knoll Nature Center in Milton.

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*ARNOLDIA is a publication of the Arnold Arboretum
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ARNOLDIA

The Arnold Arboretum - Vol. 30, No. 2 Mar./Apr. 1978

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ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Mass. 02130

*Published six times a year: in January,
March, May, July, September, and November.
Subscriptions \$8.00 per year. Single copies \$2.00.
Second Class postage paid at Boston, Mass. Copyright © 1978 by the
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JEANNE S. WADLEIGH, Editor

MARGO W. REYNOLDS, Assistant Editor
PETER J. CHVANY, Photographer

Cover: Chionodoxa spp. Photo: P. Chvany

Plant Protection

by KENNETH SHAW

Plant protection involves the proper selection, placement and establishment of a plant in a favorable environment that will maintain its health, thus minimizing the need for chemical control of pests and diseases. The concept is as applicable to the backyard gardener as it is to the commercial grower.

Selection is the key to successful establishment and plant longevity. Aside from aesthetic considerations such as differences in flower color or leaf texture, a plant should have proven hardiness and suitability for the climate and site in which it is to be placed.

The minimum temperature and the amount of annual precipitation in a region are often the most important factors regulating plant hardiness; soil factors strongly influence a plant's suitability for the prospective growing site. An ornamental variety that occasionally suffers winter injury from low temperatures or drying winds may temporarily lose its aesthetic value if subjected to such conditions. If repeated winter injury occurs, the plant may lose its functional value as well.

Annual rainfall can be supplemented by timely irrigation, but little can be done about the effects of excessive precipitation, except for the possible improvement of soil drainage. The soil can be altered to improve its texture or depth on a small scale, but extensive alterations are costly.

Growing conditions within a site may vary from more severe to more favorable than the established norm for the area. The subtle differences in soil drainage, pH, air drainage, light, wind velocity and direction, and the site's proximity to salt water, pavement, or utility lines will influence the plant's health, as well as the life cycles of organisms associated with the plant. A slight modification of the micro-environment to improve the site suitability for a particular plant or crop is often practiced in plant protection. Sometimes, as in the case of the common scab of potatoes, a cultural change (such as the lowering of the soil pH below 5.2) has its principal effect on the pathogen (*Streptomyces scabies*) which thrives in soil with a pH of 5.2 or above.

However, should a site require continual modification or the plant need continual protection from an adverse environmental factor, it would be wiser and easier to select a plant suited to the site's limitations.

A systematic survey of the living components in and around a proposed planting site (biotic community) will greatly aid plant selection, and is a basic tool of plant protection. Notes are made on the various plants and animals found in the environs; the survey also may detect the presence of any organism that may threaten the health of a newly established transplant. Observation of the existing plants in the community will give a clue to the prevalence and variety of disease or pest organisms at hand. Plant selection then is based upon species resistant to the local diseases or pests. An example of this is the choice of *Ilex pedunculosa* for *I. opaca* in instances where leaf miners are a serious problem. The former, a highly ornamental species, is not affected by these pests.

The function or purpose of a plant in a garden or landscaped area is a limiting factor in selection. The space that is to be occupied by the plant material should be sufficient for the plant's normal growth and mature size. Proper selection and placement eliminates the need for restrictive pruning, which creates not only a higher level of maintenance but also wounds that are possible sites for the entry of, and subsequent infection by, disease or decay organisms.



Holly leaf miner destroys the value of holly leaves for Christmas decorations. A chemical spray applied before females deposit eggs is an effective control. (Photos except as noted: P. Chvany)



Black Knot on cherry caused by a fungus. Partial control requires pruning and burning infected stems in late fall and early spring.



Egg mass of the eastern tent caterpillar, often found on roadside cherries and crabapples. Controlled by pruning and removing in late fall or early spring.

Once a range of suitable species has been determined, attention can be given to varietal and aesthetic considerations. It is best to avoid monoculture, which is the large scale culture of a single crop, because it creates a situation that (a) invites an organism to adapt or at least increase its population by supplying it with an easily attainable food material in large amounts or (b) causes the removal of natural balance organisms by the destruction of their niche. The Colorado potato beetle, *Leptinotarsa decemlineata*, is an example of a native insect that became a pest because man's activities created a better food source. Prior to potato cultivation, the Colorado potato beetle fed on various wild species of *Solanum*, and was of no economic significance. Now this beetle is a serious pest throughout most of the United States and parts of Europe.

Another example is the spread of the Dutch Elm Disease, caused by *Ceratocystis ulmi*, after its introduction into the United States where it decimated many an elm lined street. The fungus, after initial development in the xylem, is transported throughout the tree via the vascular system and can be transmitted from tree to tree via spontaneous root grafts. The disease also can be vectored by bark beetles. The adult beetle inoculates a healthy tree by depositing fungus spores in the wounds made during its feeding. Monoculturing of the elm along streets increases the possibility of root grafts and subsequent disease transmission; in other words, control of the insect vector alone will not stop the dispersal of this fungal disease. Had a mixture of tree species suitable for street plantings been interplanted with an American Elm, the dispersal of the Dutch Elm Disease would have been at least slowed and those trees immune to Dutch Elm Disease might now remain, providing visual relief to what otherwise would be barren streets.

Correct identification of any organism in question, as well as a study of its life cycle and habits, will indicate if there is a need for control measures and when the control should be implemented. Usually, after initial pest identification, a second survey, sometimes a series, is made to monitor the pest populations' growth and dispersal, as well as to discover any evidence of indigenous biological controls.

In an effort to find an approach to safe, non-chemical insect and disease control, many federal, state, and private agencies have researched the possibility of integrated pest management programs. These combine the natural resources in an area, and all information and control methods known for a given pest; in each case the goal is a program that will give adequate control, while being non-disruptive to the environment.

The principles of pest prevention are based on exclusion, containment, eradication, protection, and immunization. Exclusion of pests by quarantines prevents the pests from entering uninvaded areas where natural control organisms do not exist. Containment of a pest within an area is done by field inspections and the shipping of only

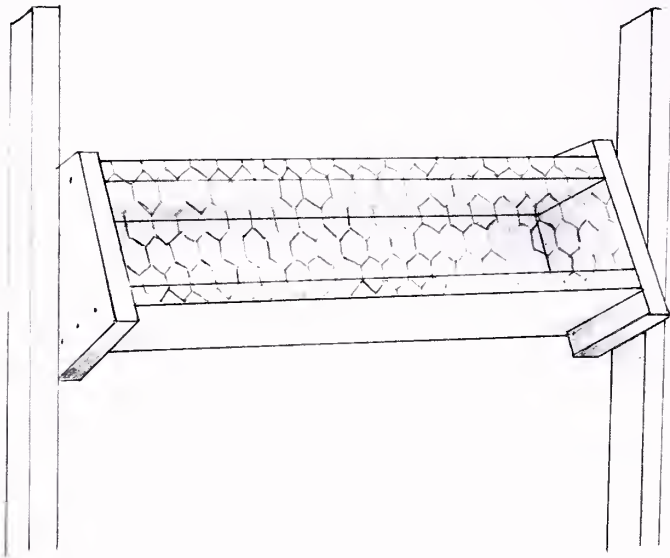


Gypsy moth eggs are laid in protective spots on tree trunks and on the underside of limbs. Egg masses can be physically removed or painted with creosote. (Photo: K. Shaw)

certified, "disease free" stock into new areas. Eradication or elimination of an introduced pest is usually accomplished by chemical means since an introduced pest has few, if any, natural enemies in its new environment. Should that environment be favorable to the pest, its population could quickly overrun the area. This has happened in the case of the gypsy moth and the Japanese beetle.

Unfortunately, exclusion and containment are not always effective, and eradication is not one hundred percent certain; therefore, susceptible plants require protection and possible immunization. By crossing susceptible but desirable plants with those that are resistant, but perhaps less desirable, the hybridizer tries to build a resistance to most pathogens in the hybrid. The Surecrop strawberry with its multiple disease resistance is a strain that evolved in this way.

In some situations, augmentation and conservation of biological controls will provide an adequate level of control. Encouraging the overwintering of birds that feed on insects and their eggs by providing bird nesting sites and food near the infestation, or attracting colonies of predatory wasps by supplying them with shelters or nesting boards are two cases in point.



Typical structure used for sheltering wasps in the field.
(Drawing: S. Geary)



The egg mass of a praying mantid, which overwinters in this stage. Egg case should not be destroyed, for this insect feeds on a variety of harmful insects, providing biological control.

In other instances, the use of biological control organisms alone is not enough for the complete control of disease or insect damage, and chemical protectants must be applied. The application of a chemical control should either be scheduled to avoid interference with the key beneficial organism(s), or selective in its control of *only* the pest species. In this way, the chemical controls are integrated with the natural or applied biological controls.

The interaction of three basic conditions are necessary for the development of a pest build-up.

1. The pest must be prevalent in the area. Most pests have a limited dispersal range, though several fungi that cause disease travel great distances by the wind, and pests often enter a new area on



Adult black vine weevil emerges at night and feeds on the foliage of various ornamentals including Taxus and Rhododendron.

Typical adult weevil damage is the notching of leaf margins.

transported stock and must over-winter in the area. The removal of barberry from the wheat growing areas is an example of an effort to reduce the prevalence of the causal agent in an area.

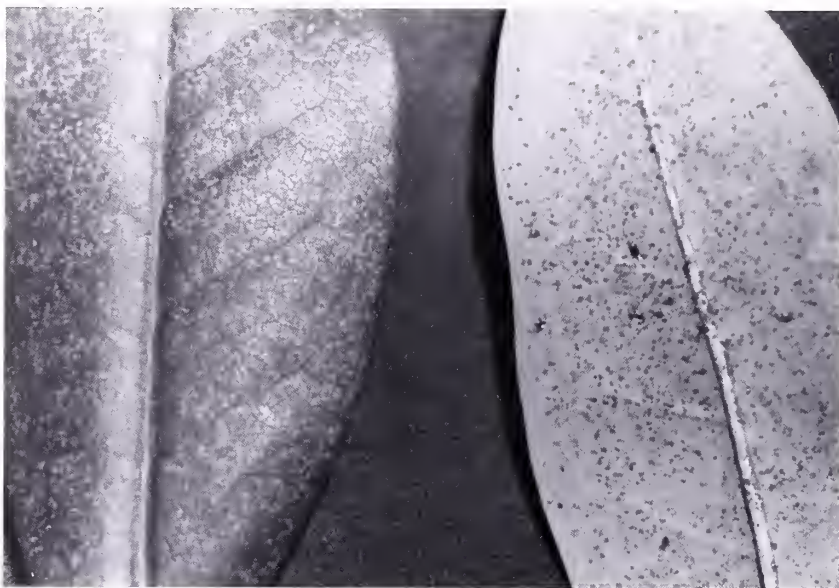
2. The environment must be favorable for the pest during reproduction, dispersal, and infestation or infection. The environment could also have adverse effects on the susceptible plant or on the pest's natural control organisms; both situations allow the pest organism more freedom and increase the chance of widespread disease or damage.

3. A supply of susceptible plants is needed. Monoculture often provides the third condition for a disease outbreak, but natural areas, like the pine forest, also offer a plentiful supply of susceptible plant material needed for the growth of a large pest population.

Apart from weather conditions favorable to the pathogen or pest, most pest outbreaks are the result of man's activity. Through poor sanitation practices he has allowed disease organisms to remain in an area year after year. The careless use of wide range pesticides has removed natural balance organisms, inducing as many problems as it has controlled. Man, through travel, commerce, and war, has greatly aided the distribution of some pest organisms.

There are many manuals that describe the cultural requirements of the various economic and ornamental plants; some of these are





Lacebug injury on Rhododendron. Damage on upper leaf surface (left) is similar to that caused by iron deficiency.
(Photo: K. Shaw)

listed in the Bibliography. It is best to read the manual before trying to establish a new planting; in this way, one avoids a lot of trial and error, lost time, and disappointment.

A seed, given proper conditions for germination and growth, can adapt itself to adverse microclimates, provided that all requirements for growth are at least minimally present. For example, there is the environmental adaptability of *Ailanthus altissima*, the Tree of Heaven, to grow in dark city alleys, between cracks in the pavement, and to withstand nearly all the pollutants a city can heap upon it. Despite this abuse, it regenerates, disperses, and flourishes.

The selected transplant initially needs a more benign environment than does the developing seedling. It is necessary to prepare for anticipated stresses from the environment during the period from transplanting to establishment. Prevalent stresses include water loss, nutritional disorders, strong winds, heat, reflected light, unsuitable soil pH, soil moisture disturbances, pollutants and tissue damaged in the process of transplanting. The composite result of several stresses is a plant predisposed to the ingress of pathogens or pests.

One also must consider the age of the plant, the season of transplanting, the type of aftercare needed, as well as unexpected environmental challenges, and then compensate for any detectable deficien-

cies. Ways to compensate would include supporting trees with guide wires or stakes to protect them from strong winds, mulching to reduce soil water loss, pruning to improve branching structure, as well as to balance the stem/root system, adding fertilizer or lime to improve nutrition, placing wind screens to reduce desiccation, utilizing soil additives to improve moisture retention or drainage, and monitoring of pest population and migration for timely application of proper chemical protectants. The initial compensation for environmental deficiencies will allow for a more rapid establishment of the plant material, after which the transplant should be capable of existence with a minimum amount of maintenance.

Plants that provide shade, screening, architectural elements, or function in other ways within a garden or landscaped area should be selected and established with the above priorities in mind; in this way the garden area will be largely maintenance free. This allows time for growing other plants that may require more maintenance, but are desirable for their unique aesthetic characteristics.

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*Crown gall on flowering dogwood. Disease micro-organisms often enter nursery stock through wounds made while handling the plant in the nursery.
(Photo: K. Shaw)*

The Case of the Dunbar Dogwood: A Neglected Hybrid

by C. LEWIS KEHNE

Arboreta and botanical gardens commonly grow related species in proximity to each other for ready comparison of species characteristics. The Arnold Arboretum, for example, has thirty-three species of the genus *Cornus*, the dogwood, and forty-nine named varieties, forms and cultivars. Hybrids between closely planted species might be expected when bees and other pollinators can readily visit several plants bearing flowers at the same time, carrying pollen from one species to the pistil of the flower of another species. Different flowering times would prevent such hybridization as would genetic barriers between species not closely related. When fruits are collected and the seed germinated, many plants will produce seedlings that are all alike and comparable to the parent plant, indicating that the pollen involved in fertilization presumably came from the same flower or perhaps another flower on the same plant. Often, however, the seedlings will show a great deal of variation in stem color, leaf pubescence, or habit, suggesting to the propagator that more than one species is involved and that the seedlings represent hybrids. When the seedlings reach flowering age, other characteristics — including a high percentage of abnormal pollen or a light fruit production or the failure to produce embryos — may confirm a hybrid origin. The hybrids may be of horticultural interest in presenting minor variations from either parent or the combination of characteristics of the parent species. Five such hybrids of *Cornus* have been recognized and described as species by Alfred Rehder, the outstanding horticultural taxonomist of the past century. Two of these species came from the collections of the Arnold Arboretum and three from the materials grown by the Parks Department in Rochester, New York.

The first recognized hybrid was named *Cornus* \times *arnoldiana* Rehder in 1903, when a variant was noted among shrubs recently planted in a row on the Arboretum grounds. Rehder considered this shrub to be a hybrid of *Cornus obliqua* and *C. racemosa*, both native species.

Dunbar Dogwood (Cornus dunbarii) in flower. (Photos: P. Chvany)

As number 4628, it is among the earliest numbered collections in the Arnold Arboretum. Although first described from cultivation, this hybrid subsequently has been found in the wild from New England to Missouri where the species are in proximity. The seed parent was not specified in the original description nor in the nursery record and it is not known if the cross can be reciprocal.

In 1923 a variant grown from the seed of *Cornus paucinervis* was recognized in nurseries at the Arnold Arboretum and described a year later by Rehder as *Cornus dubia*. Rehder suggested the pollen parent was *C. amomum*.

In between these two publications, Rehder received a plant from Rochester that was recognized in 1906 but not described until 1914 as *Cornus* \times *slavinii* Rehder. This hybrid of *Cornus rugosa* and *Cornus* "stolonifera" was named for B. H. Slavin, Superintendent of the Rochester Department of Parks (1925-1940), who sent material to Rehder. *Cornus* \times *slavinii* also has been found infrequently from New York to Wisconsin within the range of the native parents.

In 1919 John Dunbar, Assistant Superintendent of Parks (1891-1915) and later Superintendent (1915-1925) in Rochester, sent to



Rehder two specimens obtained from a seed lot collected from *Cornus macrophylla*, a species introduced to cultivation from Asia in 1827. Dunbar indicated in subsequent correspondence that nine years earlier an employee of the park, William Edson, had collected the seeds of *Cornus macrophylla* and as a routine experiment in seed culture had germinated three hundred seedlings, two hundred of which had been planted out in a nursery and were now 9 feet tall. Dunbar wrote to Rehder "Is it not strange that amongst all of these seedlings there does not appear to be one true to the characters of *C. macrophylla*?"

Dunbar noted that "*C. asperifolia* stands about 75 feet east of *C. macrophylla* and *C. amomum* about 150 feet distant on the east side. I might say that *C. arnoldiana* and *C. bretschnideri* stand close to *C. macrophylla* on the east side. I do not suppose that either of these species could have any influence on *C. macrophylla*, although they flower somewhat late."

Rehder had his clues from the identity of the neighboring plants and described *Cornus* \times *horseyi*, a hybrid of *C. macrophylla* and *C. amomum*, and *Cornus* \times *dunbarii*, a hybrid of *C. macrophylla* and *C. asperifolia*. The two hybrid species therefore came from the one lot of seed. Both *Cornus asperifolia* and *C. amomum* are native to eastern North America while *C. macrophylla* was introduced from its range in Asia of Japan, China and the Himalayas. Only in a botanical garden could such hybrids occur naturally or be produced artificially. *Cornus* \times *horseyi*, named for the first curator and taxonomist of the Rochester Parks System, is a shrubby plant with a dull purplish-red tinge to the twigs and a golden pubescence on the leaves. *Cornus* \times *dunbarii* has an arborescent habit, an ash-gray bark and whitish hairs which give the leaves a silvery appearance when fresh and dry.

Of the five hybrids, *Cornus* \times *dunbarii* has been most neglected by horticulturists, but is worthy of further consideration. The single tree in the collection of the Arnold Arboretum is now 20 feet tall with a checkered bark on a trunk 10 inches in diameter. It is densely branched with a spreading habit. Some branches nearly reach the ground and many are contorted and rope-like in appearance. Although it bears most of its delicate white flowers in tightly packed corymbs in late June and early July, the plant continues to produce flower clusters into October. Fall color is not outstanding and the fruits are blue-black in contrast to the reddish pedicels and inflorescence branches.

Cornus \times *dunbarii* is not listed in Hortus III, suggesting that there are no commercial sources for this hybrid. The only location mentioned in the microfiche records of the Plant Sciences Data Center is the Arnold Arboretum. Herbarium specimens, however, indicate that the plant was grown in Rochester and in the Cedar Brook Park *Cornus* collection, Plainfield, New Jersey recently. Neither Bean



Dunbar Dogwood (Cornus dunbarii) in fruit.

(*Trees and Shrubs Hardy in the British Isles*, 1970), Hillier (*Manual of Trees and Shrubs*, 1972) nor Krussman (*Handbuch der Laubholze*, 1972) mention the Dunbar dogwood and it is not represented in herbarium specimens from European gardens.

Derman in 1932 (*J. Arnold Arb.* 13: 410.) reported an abnormal pollen percentage of 75 for *Cornus* \times *dunbarii* and a low rate of fruit production of one or two drupes per corymb. The rate of fruit production, however, does seem to vary from year to year. The current crop of fruit seems to have well formed embryos and experiments concerning the fertility, viability of seeds and vegetative propagation have been initiated at the Arnold Arboretum. Whether a difficulty in propagation or simply oversight has resulted in the obscurity of the Dunbar dogwood is of little consequence. The subtle white flowers of *C. dunbarii* lack the commercial appeal of the more prevalent,

bracted, ornamental species; yet the extended period of flowering, the attractive habit, the unusual branch form, and the greater hardiness compared with *C. macrophylla* suggest that it has a place in cultivation.

The Dunbar dogwood stands as a silent reminder of the way in which nature, aided by man, seeks and achieves diversity.

I am grateful to Mr. James W. Kelley, plant taxonomist at the Department of Parks in Rochester, for his aid in identifying those former staff members honored by the hybrids of *Cornus* described by Rehder.

C. Lewis Kehne (Arnoldia 37: 249. 1977), as a horticultural trainee in the summer of 1977 admired this plant and chose to investigate Cornus × dunbarii, as a summer thesis. Current address: Albright House, Smith College, Northampton, Mass.



Labelling

by DONNA A. LYNCH

Since the beginning of the Arnold Arboretum, labels have played an important role in its development and function. The labelling system has been evolving for over a hundred years, becoming progressively more responsive to our needs as an institution, to other arboreta and botanical gardens, and to the public. At this time, the focus of the labelling system is on the needs of the public.

A survey taken in May 1977 revealed that 92 percent of the people who visit the Arboretum, whether for recreation or education, look at the labels. While some are not intent on learning more than the names of the trees, many would like to see more information. Questions people ask are: When does it flower? What color are the flowers? How old is it? What is its ultimate size? What country does it come from and in what kind of environment does it grow in that country? And perhaps the most pertinent to them is, will it grow in my back yard?

Because of size limitations, it is impossible to include all this information for each tree on every label. We have designed some larger labels for a select number of trees which will include these specifics, but most trees will eventually carry a new label with the botanical name, common name, and one piece of data. Observing many trees of one species will enable the visitor to acquire much additional information as well as to see the trees at different sizes and in different habitats.

Information is the most important aspect of the labelling system, but it must be well presented to be effective. Labels must be readable and visible from a distance. The yellow metal labels traditionally used by the Arboretum are visible, but due to the wear from weather, vandalism, and repositioning to allow for tree growth, the paint easily cracks and the metal beneath rusts, obscuring the whole label.

Display labels are nailed to trees of sufficient girth. Nails must protrude at least 1" to allow for tree growth. (Photos: D. Lynch)

Two new systems, in experimental use now, are rectifying these problems. Both employ a photographic process using an aluminum base. After the content of the label is determined, copy is printed with a headliner machine (ours is a StripPrinter), and pasted to a sheet of transparent mylar. In the first process, Foto-Foil, this sheet of copy is sent out to be made into a negative and finished label. Although these are relatively expensive, the label is guaranteed to last twenty years.

The second process, Scotch-Cal™ is less expensive and can be done entirely "in house." It has a guaranteed outdoor life of three to five years, which is adequate where vandalism is a problem. In this process, the copy is placed underneath the Color Key negative material and exposed to ultra-violet light for three minutes. The negative then is developed with isopropyl alcohol, washed with water, dried, and placed on top of the photo-sensitive aluminum base. After another three-minute exposure to ultraviolet light, the developing process is repeated and the plate is sprayed with a fixer to permanently seal the surface.

Foto-Foil labels are thick enough not to require mounting. Scotch-Cal™ labels are thin and do need additional backing. Backing materials variously used are wood, metal, or plastic. Scotch-Cal's base material comes adhesive-backed, which greatly facilitates mounting. The photo-sensitive sheets for Scotch-Cal range in size from 10 × 12 inches to 24 × 48 inches and can be cut easily with a paper cutter. The Foto-Foil labels are cut to our specifications since they require a metal shear.

The display labels described above are trunk labels for trees that have attained a sufficiently wide girth. All trees and shrubs also carry a smaller scientific label that is attached before they leave the nursery for the grounds in the spring and fall transplanting program. These

Above right: A Foto-foil label for the ground cover beds at the Case Estates. Much information can be placed on the label because it is read from a short distance only.

Below right: Three Scotch-cal™ labels, each having a different piece of data, are attached to three different trees in a group.

STEPHANANDRA INCISA 'CRISPA'

DWARF CUTLEAF STEPHANANDRA

A LOW SHRUB FOR SUN TO LIGHT SHADE.
HEIGHT: 18 - 36"

NATIVE TO KOREA AND JAPAN; THIS CULTIVAR ORIGINATED IN DENMARK ABOUT 1930.

FLOWERS: IN 2" LONG CLUSTERS, GREENISH
WHITE, INSIGNIFICANT, MID-JUNE.

FOLIAGE: AUTUMN COLOR REDDISH-PURPLE
TO RED.

ASSETS: DENSE AND PERSISTENT; THRIVES
IN POOR, DRY SOILS.

LIMITATIONS: SOMEWHAT UNTIDY APPEARANCE;
NEEDS PERIODIC PRUNING TO KEEP
ATTRACTIVE.

PROPAGATE BY DIVISION BEFORE GROWTH STARTS IN
EARLY SPRING, OR BY SOFTWOOD CUTTINGS IN JULY AND
AUGUST.



ARNOLD ARBORETUM

**PINUS STROBUS
EASTERN WHITE PINE**

**Largest northeast
conifer**

**PINUS STROBUS
EASTERN WHITE PINE**

**Susceptible to ice
and wind damage**

**PINUS STROBUS
EASTERN WHITE PINE**

**Pinaceae
Eastern North America**

labels also are in the process of evolution. More information is being added in a layout comparable to the one below:

ACCESSION #	BOTANICAL NAME
COMMON NAME	
ORIGIN	
FAMILY	
PROPAGATION METHOD	

As the plain aluminum scientific labels now in use are damaged or lost, they are being replaced by a color-coded label. There are four color possibilities: Orange labels indicate plants that the Arnold Arboretum has introduced into cultivation in the United States. Plants that have been the basis of new names and descriptions in botanical literature are indicated by blue labels. Deciduous plants with no other designation carry yellow labels. Evergreens and azaleas are designated by red labels. This enables anyone to tell at a glance into which category a given plant falls.



To be valuable to an arboretum or botanic garden, a plant must be well documented. The labelling system is coordinated with a record file, a computer file, and a mapping system. This enables us to correctly replace any lost labels, and insures that no plant ever loses its history.

Sources

Scotch-Cal

Ardon Graphics
176 Brookline Ave.
Boston, MA 02215
3M Company, Decorative Products Division
3 M Center Bldg. 223-15
St. Paul, Minn. 55101

StripPrinter

StripPrinter Inc.
P.O. Box 18-895
Oklahoma City, Okla. 73118
Also available through Ardon Graphics

Photo-Foil

George Day Co.
6 Southhampton Rd.
Amesbury, MA 01913

Scientific Label Plates

Addressograph-Multigraph Corp.
64A St.
Needham, MA

Two scientific labels are attached with aluminum wire to each plant, one in a conspicuous place and one somewhat hidden.

ARNOLDIA REVIEWS

Edible Nuts of the World. Edwin A. Menninger. Stuart, Florida: Horticultural Books, Inc. 173 pages, illustrated. \$14.95.

This book deserves a two-part review, one descriptive, and the other critical. It is an excellent and potentially useful compilation in the pattern of the author's earlier works, *Fantastic Trees*, *Flowering Vines of the World*, and others. Nearly every plant or plant part that might be called an "edible nut" is included. The text is presented in thirty chapters of intriguing titles and associations, and consists primarily of quotations from the forty-seven books cited as references (with other references interspersed in the text), supplemented by quotations from "several hundred friends all over the world." The personal comments of the correspondents add to the charm and value of the text. They represent opinions and observations that otherwise might never appear in print. The correspondents, too, have contributed, in their areas of specialization, such items as the definition of hazel nut, filbert or cobnut, and have clarified the confusion in the literature between the two plants known as "Old Man's Stick," *Panopsis* (edible) and *Calatola* (toxic). The volume is profusely illustrated, and all figures but one serve the purpose well, for fruits and seeds are not easy to describe, and the illustrations will aid in identifications of unusual ones.

The compilation is certainly original, and therein lies much of its value as a reference volume. Although a few of the "nuts" will be familiar, uncommon facts may be noted; but in addition there are many plants with strange common names belonging to unfamiliar genera or even families. In general these are not the "nuts" of the market, and many described will not be tempting. Many are poisonous and are so marked with skull and crossbones in the margin. Others may require days, weeks, or months of preparation before they are edible in "times of famine."

However, the usefulness of this volume is impaired by its size, the arrangement of material, and a series of irritating errors. The size of the volume, 9.5 × 12.5 inches, is awkward for shelving, or for reference use as a text.

The title of the book is wrong — "seeds" are the subject matter. The definition of the word "nut" as "any hard shelled fruit or seed of which the kernel is eaten by mankind" is given twice in the introduction for emphasis, and then not followed in the text. The chapter titles are "clever," but either misleading or not helpful. The chapter on "Pumpkins and Gourds" does include those Cucurbitaceae that are treated, but not all of the Leguminosae are in Chapter 19, "Peanuts and other beans (Leguminosae)." Chapter 26 under "Monocots" is entitled "Grains and Grasses, including *Zostera*." Representatives of eleven families, nine of them Dicots, are included in this chapter, but not *Zostera*, which is presented in Chapter 22, "Water nuts," under the "Dicots."

The four-column four-page index requires an explanation. It should have been the salvation of this volume but it isn't. Some generic names in the text (e.g. *Abrus*, *Litchi*) have been left out of the index. Some common names ending in "nut" are indexed only under the general topic of "nuts," while others occur only under "chestnut," "cola," or "walnuts."

Other common names without the suffix "nut" also are found only under that heading. "Palms" represents an index unit as does "Beans," which appears twice. Errors in the alphabetical arrangement occur as do typographical errors affecting the reference value of the index. Family assignments of the genera may be faulty and misleading to the user, but fortunately *Chrysobalanus* (Rosaceae) and *Parinari* (Chrysobalanaceae) appear on the same page.

The irritating errors also include more than a few photographs printed upside down. The introduction states "The Tiger Nut or Chufa of our childhood, delicious eating though it was, is not found in this book because it is a tuber." However, Chufa is indexed and treated briefly on page 168. The chapter "Not Nuts" is devoted to plant parts "not eaten by anybody," and includes the Betel Nut and the Litchi among many others which are poisonous or of medicinal or even economic importance.

In all, a useful volume that could have been better.

RICHARD A. HOWARD

Plants-a-Plenty. Catharine Osgood Foster. Emmaus, Pa.: Rodale Press. 328 pages, illustrated. \$10.95.

Catharine Foster is a frequent contributor to gardening magazines, the author of a syndicated gardening column, and has book titles on organic gardening to her credit. Her new work is a very practical and relatively complete guide to the science and art of plant propagation. It is very attractively set with a fine type and wide margins. The photographs are well chosen and always relevant, and their placement is synchronized with the appropriate text, a feature often overlooked by editors.

The author shares her vast reading, travel, and lengthy personal experiences in gardening and one is certain she has employed all of the methods described. This is significant and unusual in a period where there are too many gardening books put together with the clipping shears rather than recollections of personal experiences.

The author describes the morphology and physiology of certain plants to demonstrate why particular propagation techniques are suitable. Sexual reproduction (from seed) is treated fully including notes on longevity in respect to vegetable seeds, of economic interest to many of us. The various vegetative propagation methods are well described, and everything is there; layering, dormant stem cuttings, current stem cuttings, root cuttings, bulb wounding and all kinds of division. Division, here, though, includes the wild cyclamen — one of the few errors noted. In general, the data is unusually accurate.

All of this material is well-documented by an especially good index of botanical names as well as a comprehensive general index. This reporter always tests books she is reviewing or buying by looking for and trying out the indices. These passed stern tests. The only fault this notoriously judgemental reviewer finds is the use and misuse of popular names and some odd classifications. The allocation of *Crinum* to "garden plants" and the statement . . . "hardy to New York" are surely errors. When said *Crinum* is Swamp Lily in one place and Angel Lily in another, the errors are compounded. Why not call it *Crinum* and educate the reader — be it individual gardener or nurseryman? Swamp Lily might well be assumed by some to be *Lilium canadensis* since it often occurs in damp places at the sides of roads.

In summary, this work on propagation is warmly recommended to the serious amateur or the commercial plantsman.

ELINORE B. TROWBRIDGE

Manual of Woody Landscape Plants — Their Identification, Ornamental Characteristics, Culture, Propagation and Uses. Michael A. Dirr. Champaign, Ill.: Stipes Publishing Company. 536 pages.

A second edition of the *Manual* first published in 1975, this edition includes information on over 150 plants not included in the first. Hardiness zone maps, additional line drawings, and discussions of keys for plant identification and those morphological features of plants most often utilized in keys, are also useful new additions. The bulk of the text, as in the first edition, is devoted to discussions or listings of information relating to the topics outlined in the title for "common and not so common" woody ornamental trees, shrubs, vines, and ground covers, both evergreen and deciduous, that are adapted to landscape use in the midwestern and eastern United States. Plants treated in this section are in alphabetical sequence either by Latin generic or species name, and this arrangement makes the volume easy to use. Notes on numerous "related species" and cultivars are also included as are helpful discussions of plant diseases and insect pests.

While this reviewer has located several minor factual errors and finds several statements on particular plants disconcerting, most of the latter are offered by Dirr as opinions or expressions of personal bias only. For example, Dirr states that *Albizia julibrissin* ". . . is not a quality plant and definitely not suited for northern climates," an observation he has undoubtedly based on this plant's performance in the midwest and one that New England horticulturists might disagree with. Aside from a very few minor errors, this same use of personal opinion and observation is what makes the book useful and interesting. This aspect is perhaps most fully evident in the notes on propagation.

Originally conceived as a textbook for use in courses in woody plant materials, this volume should prove singularly useful not only in the classroom (where a text such as this has long been needed), but in the arboretum, nursery, landscape architect's office, and in the home garden as well. Dirr indicates in the preface to this edition that yet another revision will be forthcoming, and it is hoped that this valuable reference will be refined even more in a third edition.

STEPHEN A. SPONGBERG

The Rain Forests of Golfo Dulce. Paul H. Allen. Stanford, Ca: Stanford Univ. Press. 417 pages, 22 figures, 34 plates. Reissue 1977. \$25.00.

"Our library copy has disappeared." "My personal copy cannot be located." "The volume is out of print." "No secondhand copies can be located." A familiar tale indicating a useful volume. Now *The Rain Forests of Golfo Dulce* has been reissued by a different press, unfortunately at a higher price, but still worth having. Although first published in 1956 and reissued without changes, the volume has not lost its reference value for the forest plants of Costa Rica with wide application in Central America. General descriptions are given of the ecology of the area and of the forest types with lists of component species and practical keys, e.g. "Trees with thorny or spiny trunks," "Trees with stilt roots," Fence row plants," etc. These are followed by an alphabetical listing of common names and scientific names of the species of the area, with descriptions and discussions of many. The plates, most with four photographs, are a valuable survey of many genera and species.. The volume is very easy to use. A foreword, prepared for the reprinting by Peter Raven, Director of the Missouri Botanical Garden, is a fitting tribute to the late Paul Allen.

RICHARD A. HOWARD

Ornamental Grasses. Mary Hockenberry Meyer. Charles Scribner's Sons: New York. 136 pages. Hardcover. \$9.95.

A book dealing solely with ornamental grasses has been long overdue. Finally one has arrived and, in addition to filling an obvious void, it is interesting and informative as well. By some unfortunate circumstance, ornamental grasses are all too often overlooked as landscape possibilities in many parts of the United States. I stress unfortunately because they are a versatile and exciting group of plants with much to offer. Worthy of inclusion in the garden for their stunning beauty alone, they have other merits as well: they are nearly entirely insect and disease free, they require little maintenance, and they tolerate a wide variety of soil and temperature conditions.

It is difficult to believe that this is the first popular book ever published in the United States on this subject. The British are obviously way ahead of us in their appreciation of the horticultural value of grasses. It is to be hoped that this particular volume will have some impact on the American gardening public. In addition to cultural directions, individual plant descriptions and a guide to the ornamental uses of various grasses, there is an interesting chapter on using grasses as cut flowers in arrangements. An abbreviated list of nurseries at the end of the book lists both wholesale and retail sources of plants and seeds. My only complaint about this book is in regard to the pictures, some of which are out of focus or under- or overexposed. Otherwise, it is a fine treatment of a welcome subject.

MARGO WITTLAND REYNOLDS

Saxifrages. Winston Harding. London: Alpine Rock Garden Society. 134 pages, numerous full and part-page black and white photographs and drawings. 50 British pence.

Winston Harding is a well-travelled and knowledgeable horticulturist, currently serving as Chief Horticultural Officer for an international agency of the British Commonwealth. This volume represents a compilation of articles originally written for Britain's Alpine Garden Society and its avowed intention is to restore the saxifrages to the favor they once enjoyed among English gardeners.

The fifteen species represented are described in terms comprehensible to the informed gardener and one need not be a taxonomist to understand the descriptions. The author's familiarity with the plants in the field, in the garden and under glass is evident. Cultural directions abound and each plant is considered with reference to its native habitat. There are a number of allusions to literature on the subject and the author doesn't hesitate to dispute some of the claims of the late rock garden expert, Reginald Farrer. The flavor of the book is modest and gracious.

The American and British attitudes toward rock gardening are quite different and this poses a problem as to the usefulness of this book to the American rock gardener. The reader who is a "serious" rock gardener will want to own it; others will not.

ELINORE TROWBRIDGE

Trees of the British Isles in History and Legend. J. H. Wilks. Anchor Press Ltd.: London, England. 255 pages. £5.

Trees have played an integral part in the history of the British Isles since Celtic times. Worshipped by the Druids, taken over as symbols by the Christian missionaries, the source of navies that eventually built the

British Empire, used as boundary marks after William the Conqueror, the refuge and trysting place of royalty, the great trees of the British Isles have both a romantic and an historical appeal.

This book is a compendium of facts and fancies about U.K. and Irish trees in history, legend, literature and war. It is generously illustrated with old prints and modern photographs, and has five appendices. These meticulously list the origins, habitats and records of U.K. and Irish trees, biographical notes, notable and record trees, gardens and estates where collections can be found, a further list of trees not mentioned in the text, and a series of the number of insect species on trees in Britain and European Russia.

Though the writing veers from the simplistic to the fulsome (e.g. “. . . the dark dregs of a witch’s brew of legend and unrequited hate”), the book is a pleasure to browse through, full of delights and surprises. It can be highly recommended to anyone interested in horticulture, English history, ecology, or legend.

CORA WARREN



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ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Massachusetts, U.S.A.



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ARNOLDIA

The Arnold Arboretum Vol. 38, No. 3 May/June 1978

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ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Mass. 02130

Published six times a year: in January,
March, May, July, September, and November.
Subscriptions \$8.00 per year. Single copies \$2.00.
Second Class postage paid at Boston, Mass. Copyright © 1978 by the
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MARGO W. REYNOLDS, Assistant Editor
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Cover: *Syringa persica*. From Curtis's Botanical Magazine. Vol. 18. London, 1800.

The Uncommon Lilacs - Something Old, Something New

by JOHN H. ALEXANDER III

The lilac is a favorite flower in New England where it is the state flower of New Hampshire. Its popularity also extends across the northern half of the United States and into the southern half of Canada. At the Arnold Arboretum, undoubtedly more visitors come to view the lilacs than to visit any other single collection.

We have a special fondness for this plant which is as foreign to our shores as our forefathers were. No species of lilac is native to the New World; *Syringa vulgaris*, the common lilac, is indigenous to the mountains of Europe within the countries of Bulgaria, Czechoslovakia, Hungary, Roumania and Yugoslavia. But botanists did not discover it growing wild until 1828 when it was found in western Roumania. Cultivated for centuries in Turkey, it was brought from there to Vienna by 1563 and was common in Paris by the turn of the century. French, Dutch, and German nurserymen began selecting superior seedlings and by the early 1800's offered named clones for sale. An example is the cultivar 'Lucie Baltet' which originated in France before 1888 and is still considered to be one of the best pink-flowered varieties. So many cultivars originated in French nurseries, and in particular at the nursery of Victor Lemoine, that all selections of *Syringa vulgaris* have commonly been known as French Hybrid Lilacs.

It is these French Hybrid Lilacs that we particularly love. How many of us can walk by a lilac bush in bloom and not bend close for a draught of perfume, the mind conjuring up memories of springs past? With the advent of the smaller home, this plant, so deeply rooted in tradition, has been put aside for the contractor's *Taxus*. Not only the lilac's size, but the inferior quality of late summer foliage and the profuse suckering tendencies of some cultivars have discouraged many people from growing them. But now lilacs other than the common *Syringa vulgaris* and its cultivars are being discovered by gardeners. Many of these uncommon lilacs are smaller, some even small enough to be tubbed for the patio, and most sucker little if at all. They also are more resistant to mildew and leaf roll-necrosis.

Leaf roll-necrosis is typified by the interveinal and marginal chlorosis or yellowing of the leaf, and in severe cases by the inward curling

of the leaf so that the margins actually touch. A product of our urban environment, the disorder is believed to be caused by a combination of air pollutants. (6) Since different pollutants are found in varying quantities in different environments, conclusive evidence of resistance is not available. My statements of implied resistance to mildew and leaf roll-necrosis are based on observations at Rochester, New York (5) and on observations by the staff and volunteers of the Arnold Arboretum.

With few exceptions the lilacs mentioned here may be seen in the collection of the Arnold Arboretum. Most are available in the nursery trade. The best source list is available from the International Lilac Society, an organization of amateur and professional lilac enthusiasts. Requests for information on publications and membership should be addressed to Mr. Walter W. Oakes, Secretary, International Lilac Society, P.O. Box 315, Rumford, Me. 04276.

Syringa × *chinensis*

S. × chinensis is a garden hybrid that originated in the Botanic Garden at Rouen, France, about 1777. Its parents are generally believed to be *S. laciniata* and *S. vulgaris*. A beautiful shrubby plant, it can reach a height of 15 feet but is more likely to be 8 to 10 feet tall. Its flowers are lilac-colored and somewhat smaller than those of the common lilac, with which it blooms. An attractive advantage is that it produces clusters of flowers not only at the terminals, but from lateral buds down the stems, often forming an inflorescence 2 or more feet long.

Syringa × chinensis suckers only enough to be considered multi-stemmed and is certainly not a nuisance. The foliage is similar to that of the common lilac, but smaller and appears to be resistant to leaf roll-necrosis, although it is susceptible to mildew. Appearing in late summer, mildew does no serious damage to the plant and might well be tolerated in exchange for the great spring beauty and profuse flowering habits of this hybrid.

Syringa × chinensis has proved itself to be hardy in Zone II. (3) Two forms also are available: *alba*, white, and *sangeana*, lilac-red.

Syringa × *diversifolia*

S. × diversifolia is another garden hybrid. Open pollinated seed collected in the Arnold Arboretum in 1929 from a plant of *S. pinnatifolia* gave rise to hybrid seedlings. Alfred Rehder later determined these to be a cross with *S. oblata* var. *giraldii*, which was growing nearby.

The pale lilac to white blossoms are fragrant and attractive, appearing shortly before those of *S. vulgaris* and its cultivars. Usually



about 6 feet high and almost as broad, *S. × diversifolia* has a rather open habit. It is not very popular, but this past fall I was captivated by a cultivar that we received in 1949 from the now-defunct Upton Nursery Co. of Detroit, Michigan. Called 'Noveau', its deliciously fragrant, light pink flowers rebloom in early fall when its often pinately cut foliage is an attractive burgundy and green. Preliminary observations have found it to be only slightly marred by leaf roll-necrosis and free of mildew, although all seedlings of this cross are not mildew resistant. Since all selections of *S. × diversifolia* do not rebloom to the extent 'Noveau' did last autumn, it is possible that the characteristic is not consistent; but an autumn-flowering lilac with burgundy fall foliage would be unusual and highly desirable.

Syringa × hyacinthiflora — see *S. oblata*

Syringa josikaea

The purple flowers of this Hungarian native open ten days to two weeks after those of the common lilac. *S. josikaea* is a very hardy plant, even to Zone II. (3) It grows to 12 feet, and has an upright, open habit. The attractive leaves, unlike those of the common lilac, are elliptic, glabrous above, and closely resemble those of the genus *Prunus*. They are resistant to mildew and leaf roll-necrosis.

Not a beautiful plant, the Hungarian Lilac has proved itself as a good parent in hybridization. Some very fine late flowering lilac cultivars have *Syringa josikaea* in their background. Of the several listed here, all were introduced by the University of New Hampshire, are resistant to mildew and apparently to leaf roll-necrosis.

'Agnes Smith' — single, white

'James Macfarlane' — single, pink (a true pink)

'Nellie Bean' — single, purple

Syringa julianae

This multi-stemmed but non-suckering shrub is usually a 6- to 8-foot mound of slender branches. Hardy to at least Zone V, it blooms with the common lilac. Unlike *S. vulgaris*, its pale-lilac panicles appear from lateral as well as terminal buds, making the flower clusters appear much larger. The small leaves are not troubled by mildew, but have exhibited slight leaf roll-necrosis.

The cultivar 'Hers Variety' has gracefully arching branches that are more weeping than those of any other lilac. This cultivar, when grafted on a 5- or 6-foot standard, makes an absolutely stunning patio plant.

Syringa laciniata

Formerly known as *S. persica* var. *laciniata*, the Cutleaf Lilac is now considered to be a true species, and *S. × persica* a hybrid. The leaves of *S. laciniata* are deeply lobed and present a dainty, feathery appearance; they also are resistant to mildew and leaf roll-necrosis.

This Chinese native is hardy to Zone V and forms a graceful many-stemmed, non-suckering 6-foot mound of a shrub. Pale lilac flowers are produced in season with *S. vulgaris*. Because they break from lateral and terminal buds, the small clusters of flowers often cover 18 or more inches of the branch tips.

The unique foliage, attractive flowers and graceful habit make this lilac a favorite of all who know it.

Syringa meyeri

S. meyeri was unknown to the western world until 1908 when F. N. Meyer of the U.S.D.A. found it being cultivated in China. Purple-lilac flowers grace this handsome lilac that blooms in season with *S. vulgaris*, but unfortunately lacks its fragrance. The foliage is small, less than 2 inches long, and is not troubled by mildew or leaf roll-necrosis. A multi-stemmed, compact shrub not usually more than 6 feet tall and as broad, it is hardy to Zone II. (3) Specimens at the Morden Arboretum, Morden, Manitoba, are given a hardiness rating of 9 and 9.5 on a scale of 10.



The correct name of a cultivar of *S. meyeri* known in the nursery trade as *S. palibiniana*, and "Dwarf Korean Lilac," (but in reality from China) has been the subject of much confusion. Consternation regarding the correct name of this cultivar prompted me to write Peter S. Green, Keeper of the Herbarium, Royal Botanic Gardens, Kew, England. Mr. Green, a former Arnold Arboretum staff member, is probably the world's foremost authority on the taxonomy of the genus *Syringa*. His reply follows:

S. palibiniana in a strictly taxonomic sense is a synonym of *S. patula*, and the popular dwarf lilac bearing this name, which is in widespread cultivation, is a misidentification. I believe it to be a cultivar of *S. meyeri* and intend to call it cv. 'Palibin'.

More compact than the type, 'Palibin' can, with a little pruning, be maintained at 3 feet in height. A more formal approach would be to graft it high on a standard. Potted up, this lilac might well be used as a patio plant. It is so hardy that, in the vicinity of Boston, one might get by with only a minimum of winter protection. Bags of leaves or a mound of wood chips protecting the root ball probably would be sufficient. If your climate is colder, or if your patio is a raised wooden deck where the root ball would be exposed to cold air from underneath, it would be safer to plunge the pot in the vegetable garden or other convenient spot for the winter.

Syringa microphylla

S. microphylla is a most handsome small shrub; its height is usually 6 feet and it may grow to be twice as wide. The ovate, mildew-resistant leaves are usually less than 2 inches long, giving the plant its common name, the Littleleaf Lilac. Unfortunately, the leaves are somewhat susceptible to leaf roll-necrosis. The flowers of the species are a light pink or pale lilac color. They open at the same time as the common lilac and frequently rebloom in August or September. This second bloom is somewhat sparse and not really significant in the landscape, but in late summer it is most enjoyable to have a vase full of these fragrant lilac blossoms gracing the dinner table. The deep pink flowers of the cultivar 'Superba' are even more effective, but its foliage seems more likely to display leaf roll-necrosis than the species. *S. microphylla* has proved itself hardy in Zone III and survives in Zone II. (3)

Syringa oblata

S. oblata closely resembles the common lilac, but blooms ten days to two weeks before it, usually about May 10 in Boston. It is best known by the varieties *S. oblata* var. *dilatata* and *S. oblata* var. *gir-*



Syringa microphylla.

aldii. Neither one of these is exceedingly beautiful in and of itself, but each, when crossed with *S. vulgaris*, has proved to be an excellent parent. This cross has given us the hybrid race *S. × hyacinthiflora*, which has greatly extended the flowering season.

Syringa × hyacinthiflora

S. × hyacinthiflora includes hybrids between *S. vulgaris* and two varieties of *S. oblata* — *S. oblata* var. *dilatata* and *S. oblata* var. *giraldii*. A number of cultivars of this group are available. Closely resembling *S. vulgaris* in appearance and fragrance, they flower a week or ten days earlier. They are very hardy, many of them having been bred at Dropmore Nursery, Dropmore, Manitoba, Canada, where winter temperatures of -50°F are not uncommon.

The *Syringa oblata* var. *giraldii* hybrids are often rather tall and leggy and benefit by frequent, ruthless pruning. Hybrids of *S. oblata* var. *dilatata* tend to be very broad shrubs, and are apparently less susceptible to leaf roll-necrosis. Although both *S. oblata* var. *dilatata* and *S. oblata* var. *giraldii* hybrids show resistance to mildew, those of the former are usually more resistant.

Some favorite cultivars are:

- (D) indicates *S. oblata* var. *dilatata* parentage
- (G) indicates *S. oblata* var. *giraldii* parentage

- 'Alice Eastwood' (G) double, magenta
- 'Anabel' (D) double, pink
- 'Assessippi' (D) single, lilac
- 'Doctor Chadwick' (D) single, mauve — nice compact habit.
- 'Esther Staley' (G) single, magenta
- 'Jewel' double, pink
- 'Necker' (G) single, pink
- 'Pocahontas' (D) single, pink

Syringa palibiniana — see *S. meyeri*

Syringa patula

S. patula, formerly known as *S. velutina*, is a tall shrub with an upright habit and pale lilac flowers. Hardy to Zone II, (3) this Korean native has foliage that is resistant to both mildew and leaf roll-necrosis. Although the species is not generally considered to be a horticulturally desirable shrub, it has given rise to an exceedingly beautiful cultivar, 'Miss Kim'.

Professor E. M. Meader of the University of New Hampshire collected seed of *S. patula* in the Poukhan Mountains of Korea in 1947. (8) One seedling, later named 'Miss Kim', became a slow-growing compact shrub with fragrant pale lilac flowers in spring and handsome burgundy-red foliage in the fall. The individual flowers, although somewhat small, are abundantly produced and appear at the same time as the later cultivars of the common lilac.

Syringa pekinensis

Forty-foot trees of *S. pekinensis* have been reported in China where this species is native, but on this continent it is usually a small tree, seldom reaching 25 feet. It is hardy at least to Zone III and what is probably the oldest specimen in the New World is maintained in Canada by the Ottawa Research Station. Their 76-year-old plant was grown from seed obtained from the Arnold Arboretum in 1902. The tree now approaches 25 feet in height and has a canopy of about 30 feet. The two main stems are 12 and 15 inches in diameter respectively and the bark is attractive and slightly exfoliating. (2)

The degree to which the bark exfoliates varies greatly between specimens. Some trees at the Arnold Arbortum show little or no exfoliation, while others display masses of orangey-brown bark strips from all but the oldest branches. The two plants with the most attractive bark, numbers 21634 and 21635-B, were both collected as

seed by Joseph Rock in 1926. Number 21634 is quite a bit broader and has a larger trunk than the latter; both approach 25 feet and may be taller. Their habit is reminiscent of that of an apple tree and they might be recommended for use anywhere a small low branching tree would be appropriate.

In the vicinity of Boston this lilac flowers about June 15. The creamy white flowers have a privet-like fragrance and closely resemble those of the other tree lilac, *S. reticulata*, with which it blooms. The foliage of this species is attractive and resistant to mildew. Some specimens are reported to have leaf roll-necrosis, while others appear to be resistant.

The exfoliating bark of this species offers year-round interest and makes the bare winter branches attractive. Because seedlings have varying bark characteristics and varying degrees of resistance to leaf roll-necrosis, only selected plants should be propagated and those, asexually.

The cultivar 'Pendula' is available, but unfortunately is not very pendant.





Exfoliating bark of Syringa pekinensis. Photo: J. Alexander.

Syringa × *persica*

S. × persica is a handsome, many-stemmed shrub about 6 feet in height and as much or more in width. Never found in the wild, it is apparently a hybrid that perhaps originated in the gardens of Persia, where it was cultivated for centuries. *S. laciniata*, which was formerly known as *S. persica* var. *laciniata*, is now considered to be one of the parents. The many small clusters of lilac flowers originate from both terminal and lateral buds forming a huge inflorescence that may extend 18 or more inches from the branch tip. These flowers are produced so abundantly that they weigh down the branches into graceful arches. The Persian Lilac blooms about the same time as the common lilac, but lacks the pleasant fragrance of the latter.

S. × persica is hardy to Zone II (3) and has shown good resistance to mildew and leaf roll-necrosis. The foliage and flowers are both small, but the number of flowers and the graceful appearance of this shrub make it easy to see why it is as valuable to today's gardens as it was to those of long ago.

Syringa potanini

First discovered in 1885 in Kansu, China, by the Russian explorer Potanin, *Syringa potanini* is a large shrub approaching 10 feet in height and as wide as it is tall. A non-suckering, multi-stemmed plant, it has small, densely pubescent leaves that are resistant to mildew but not to leaf roll-necrosis.

When the common lilac is in bloom, the Potanin Lilac abounds with fragrant pink flowers held in open erect panicles, and like *S. microphylla*, *S. potanini* produces a second, less abundant flush of flowers in late summer. Hardy to Zone V, this species has long been one of my favorites; it does best with plenty of space and clean air.

Syringa × *prestoniae*

In 1920, Isabella Preston of the Dominion of Canada, Central Experimental Farm, Ottawa, crossed the species *S. villosa* and *S. reflexa*, giving us the hybrid race *S. × prestoniae*. The result of this cross was the combination of some of the best qualities of both parents, greatly increasing the number of late lilacs.

Many people are prejudiced against the late lilacs because, in their opinion, late lilacs neither look nor smell like what a lilac should. The heavily veined leaves are elliptic and the flowers, if fragrant, hint at a scent of privet. I have found however, that there is a secret to liking these lilacs, and that is not to look at them as lilacs, but as pretty shrubs in their own right.



The Preston lilacs bloom about ten days to two weeks after the common lilac. Hardy to Zone II, they are non-suckering shrubs that often reach 8 to 10 feet in height. The not-very-fragrant flowers of most cultivars are usually pinkish-lilac colored. Some cultivars, like 'Fountain', have gracefully arching branches similar to *S. reflexa*; others are much more upright, like *S. villosa*; an example would be 'Isabella'. The foliage of most is large and coarse, not very attractive, but usually resistant to mildew and leaf roll-necrosis.

Since Miss Preston's time, others have duplicated this cross and of the following recommended cultivars, those marked with an * are the result of the work of others.

'Fountain' single, pink

*'Hiawatha' (Skinner) single, pink

'Isabella' single, lilac

*'Miss Canada' (Cumming) single, pink

Syringa reflexa

S. reflexa has been most valuable to us as a parent of the hybrid race *S. × prestoniae*. It is a graceful, broad shrub that can reach 12 feet in height. When in bloom, the panicles of pink flowers arch and hang down like those of wisteria. It is this pendant characteristic that gives the species its common name, the Nodding Lilac.

Hardy to Zone III and resistant to both mildew and leaf roll-necrosis, a good specimen of *S. reflexa* can be a beautiful plant. It is apparently a highly variable species; some authors have extolled its virtues while others downgrade it. Plants of *S. reflexa* growing in the Arnold Arboretum are not very thrifty, but Mr. W. W. Oakes of the International Lilac Society has informed me that his plant does well, although the blossoms only last a day or two. He recommends *S. × swegiflexa*, a hybrid between *S. sweginzowii* and *S. reflexa*, for the same habit, but improved flowering qualities.

Syringa reticulata

S. reticulata, the Japanese Tree Lilac, was formerly known as *S. amurensis* var. *japonica*. Sometimes reaching 30 feet, it makes a handsome small tree, but when young it may occasionally need some pruning to keep it single-stemmed.

In 1876 the Arnold Arboretum received seeds of this species from Japan. A beautiful specimen (AA #1111) from this original introduction is alive today in the Arboretum's collection. It is growing close to the road near the *Forsythia* collection.

Large clusters of privet-scented flowers cover this tree in June, as it is one of the latest of the lilacs to bloom. Hardy in Zone II, (3) this species has foliage that is resistant to mildew and leaf roll-



Syringa reticulata. Photo: J. Alexander.



necrosis. When the flowers and foliage are gone, the attractive cherry-like bark is visible, making this tree visually pleasing throughout the year.

The variety *mandshurica* blooms slightly before the type, and is shorter and less treelike.

Syringa villosa

S. villosa is a large, upright shrub, as much as 12 feet by 12 feet. Its pink flowers are held in upright panicles that open ten days to two weeks after *S. vulgaris* and give it the common name of Late Lilac. The large leaves are not troubled by mildew or leaf roll-necrosis.

Not a very beautiful or popular shrub, its chief attribute is that it is hardy to Zone II, and most suitable, therefore, for use in wind-breaks on the Northern Plains. But even for that purpose, *S. josikaea* might be a more attractive choice.



Syringa reflexa. From Curtis's Botanical Magazine. Vol. 16, fourth series, 1920.

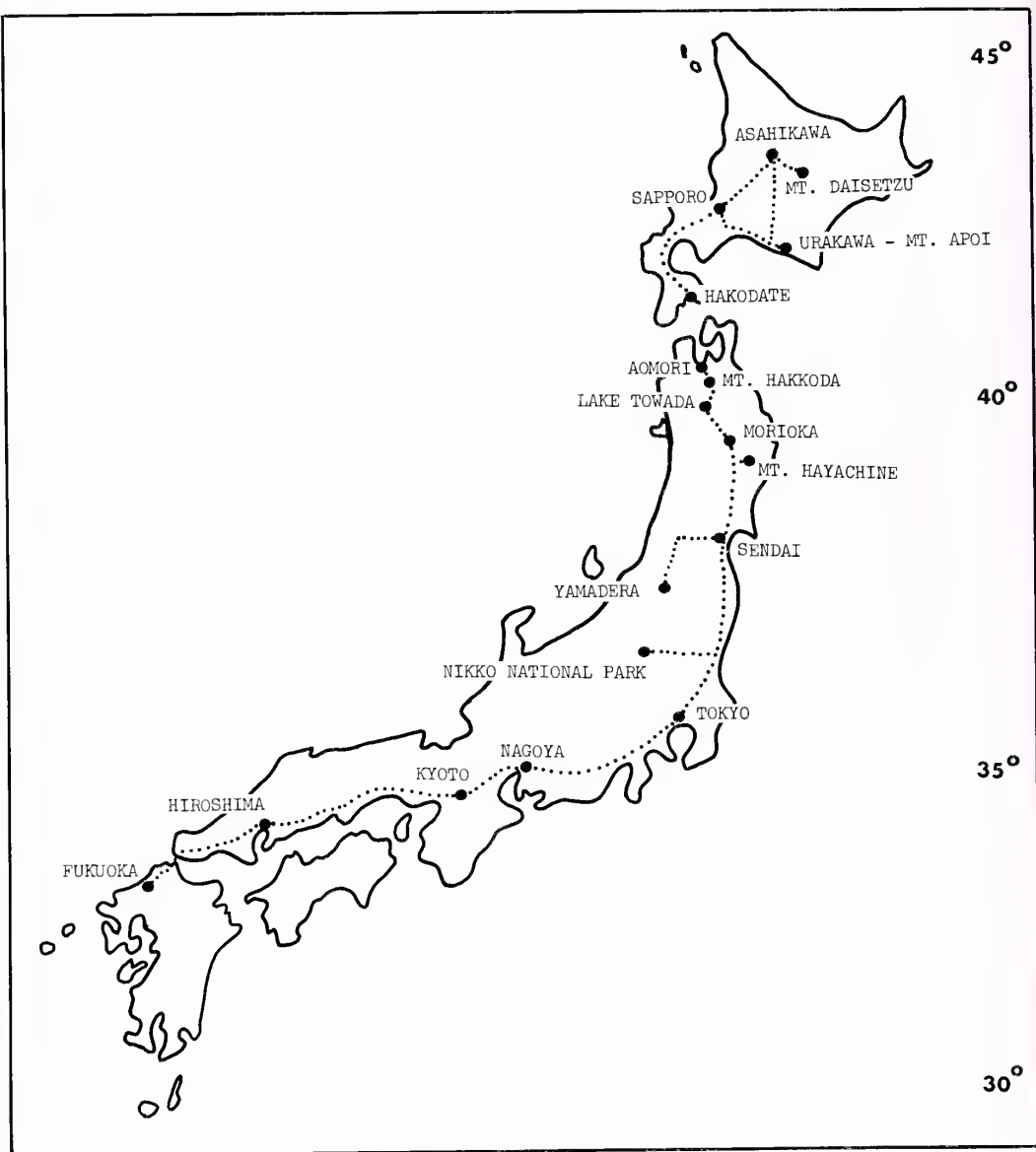
	HEIGHT	HABIT	HARDINESS	COLOR	FOLIAGE PROBLEMS		TIME OF BLOOM	FRAGRANCE
					MILDEW	LEAF ROLL-NECROSIS		
<i>Syringa</i>			ZONE					
× <i>chinensis</i>	8-10 feet	spreading shrubby	II	lilac	susceptible	resistant	with <i>vulgaris</i>	
× <i>diversifolia</i>	8-10 feet	open	VI	pale lilac	some resistance	slight	before <i>vulgaris</i>	yes
<i>josiifaeae</i>	12 feet	upright	II	purple	resistant	resistant	10 days to 2 weeks after <i>vulgaris</i>	slight, not pleasant
<i>julianae</i>	6 feet	shrubby	V	pale lilac	resistant	slight	with <i>vulgaris</i>	yes
<i>laciniata</i>	6-8 feet	shrubby	V	light lilac	resistant	resistant	with <i>vulgaris</i>	
<i>meyeri</i>	6 feet	shrubby	II	purple-lilac	resistant	resistant	with <i>vulgaris</i>	no
<i>microphylla</i>	6 feet	shrubby	IV	light pink	resistant	slight	with <i>vulgaris</i> reblooms	yes
<i>oblata</i>								
× <i>hyacinthiflora</i>								
<i>oblata dilatata</i>	10 feet	spreading	III	several	varies with cultivar		before <i>vulgaris</i>	varies
hybrids								
<i>oblata giraldii</i>	12 feet	upright	III	several	varies with cultivar		before <i>vulgaris</i>	varies
hybrids								
<i>patula</i>	8-10 feet	open	II	pale lilac	resistant	resistant	with <i>vulgaris</i>	yes
<i>pekinensis</i>	25 feet	tree	III	creamy-white	resistant	in some seedlings	3 weeks after <i>vulgaris</i>	like privet
× <i>persica</i>	6-8 feet	shrubby	II	lilac	resistant	resistant	with <i>vulgaris</i>	no
<i>potaninii</i>	8-10 feet	shrubby	V	pink	resistant	susceptible	with <i>vulgaris</i> reblooms	yes
<i>prestoniae</i>	10 feet		II	several	resistant	some cvs. susceptible	10 days to 2 weeks after <i>vulgaris</i>	like privet
<i>reflexa</i>	12 feet	shrubby	III	pink	resistant	resistant	10 days to 2 weeks after <i>vulgaris</i>	no
<i>reticulata</i>	25-30 feet	tree	II	creamy-white	resistant	resistant	3 weeks after <i>vulgaris</i>	like privet
<i>villosa</i>	10-12 feet	upright	II	pink	resistant	resistant	10 days to 2 weeks after <i>vulgaris</i>	like privet



Syringa prestoniae. Photo: D. Wyman.

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Places visited during Arnold Arboretum collecting trip in Japan.

Japanese Journal

by RICHARD E. WEAVER, JR.

The aim of the Arnold Arboretum's collecting trip to Japan and Korea in the fall of 1977 has already been explained briefly in the January-February issue of *Arnoldia*. The present article will describe in more detail our experiences in Japan; another in the next issue of *Arnoldia* will cover the Korean portion of the trip. Space allows for the description of only the most memorable days, but a detailed itinerary with a list of the plants collected each day appears at the end of the article.

Steve Spongberg and I left Logan International Airport 10:00 a.m. on September 1, and after changing planes in Chicago, headed for Tokyo. Our route took us across Canada's Prairie Provinces, the southern Yukon Territory, and Alaska's Coast Ranges to Anchorage. The views of the ice-clad peaks and glacier-filled valleys were spectacular and we had an enticing glimpse of Mt. McKinley on the horizon. After a frustrating hour at the Anchorage airport, we took off on the long last leg of our trip, arriving at our hotel approximately 15 hours after leaving Boston.

The next morning was spent in the Ginza, the main shopping district, where everything was fascinating, particularly the flower and produce shops. The former featured many standard items, but we found several surprises: One of the most common potted plants was a dwarf form of *Gentiana scabra*, a native Japanese gentian. Other gentians, particularly *G. triflora* var. *japonica*, a bottle-type, were sold as cut flowers. I could hardly believe my eyes when I first saw bunches of *Eustoma grandiflorum* in the shops. This plant is an annual member of the Gentian Family native to the southern United States, but practically unheard of as an ornamental in our country; yet the Japanese had even selected white- and double-flowered forms. Ironically their name for it meant "Chinese Bluebell."

We had been told about the produce shops before we left the United States, but it was still quite an experience to see their selection of magnificent fruits which had been carefully nurtured throughout their development, and were sold as absolutely unblemished specimens, individually wrapped, at exorbitant prices. We found Tokyo in general to be as expensive as expected. For its size it is remarkably clean, and the drivers are unbelievably well-behaved. I cannot remember hearing a horn honk in Tokyo, a marked contrast to any large Latin-American city.

Dr. Katsuhiko Kondo, or Katsu for short, a friend of Steve's from graduate student days at the University of North Carolina, met us in the afternoon. Katsu, now on the staff of Hiroshima University, was to accompany us for most of our trip. We took him to a fine restaurant that featured the best beef I have ever eaten (at prices I would rather forget) and he then took off alone by train to Sapporo on Hokkaido where we would meet again a day hence.

On September 5 Steve and I flew to Sapporo, the capital city of Hokkaido Prefecture which encompasses the whole of the northernmost of Japan's four main islands. As we ascended from Tokyo we had a glimpse of Mt. Fuji above the clouds and smog, and travelling north we tried to spot the places where we would be collecting in a week or so. Katsu was waiting in Sapporo to show us to our hotel, the Washington. It was a fine hotel, but our double room was considerably smaller than any single I had stayed in before. With barely enough room to move about, we looked ahead with apprehension to cleaning seeds in such cramped quarters. We also had our first of many encounters with the last word in the Japanese idea of western-style bathrooms — tiny and completely moulded from a solid sheet of plastic.

After lunch we walked to the Botanic Garden of Hokkaido University, where we had an appointment with the Director, Dr. Tadao Ui. As we approached the Administration Building, we remarked on its New England Colonial architecture, recalling that the University and the Botanic Garden had been set up under the direction of a Professor Clark from what is now the University of Massachusetts at Amherst. Dr. Ui and his secretary were most cordial, and they explained the itinerary they had set up for us, starting immediately with a visit to the Hokkaido branch of the Government Forest Experiment Station on the outskirts of the city. Our host there was Mr. Jun-ichiro Samejima, a vigorous and enthusiastic young man, an expert on *Trillium* who had studied at Vanderbilt University. After considerable effort we explained to him that we were very anxious to do some collecting in the wild.

In the badly cut over forests near the station we had our first good look at a plant that we came to dislike intensely — *Sasa kurilensis* — a 3- to 4-foot bamboo that has become rampant with the widespread clearing of the forests on Hokkaido, choking out everything in its path. Here it was doubly annoying to wade through since it was covered with a fine dust from the erupting Mt. Usu about 40 miles away. But we were finally able to do some good collecting, and Steve was particularly excited by finding both of Hokkaido's magnolias, *M. kobus* and *M. hypoleuca*, with nearly mature fruit.

We returned to Sapporo for a dinner engagement with Dr. Ui and some of his staff. The meal was one that I shall never forget — a traditional multi-course banquet with a great variety of food, much of which we ate with less than gusto. But at least we were able to eat with chopsticks, since we had practiced at home.



The Administration Building of the Botanic Garden of Hokkaido University in Sapporo. The architecture shows the influence of Dr. William S. Clark, a New Englander who helped develop the garden. (All photos are by author.)

The next day we toured the plantings of the Hokkaido Forest Tree Breeding Station and made a few half-hearted collections. We really wanted to collect in the natural forests which we could see only a short distance away. We were told at first that the Nopporo Natural Forest was a reserve, and that collecting was forbidden. We persisted, and finally, under the friendly supervision of Mr. Norio Murano, we were allowed into the forest. Although it had been somewhat cut over, this was the sort of place we had been dreaming of — a rich forest dominated by trees of such familiar genera as *Acer*, *Ulmus*, *Quercus*, *Magnolia*, *Styrax*, and *Carpinus*. Here we found one of the main objectives of our trip, *Skimmia japonica*, growing near the northern limit of its range. The herbaceous vegetation was fantastic, and I could imagine what the place must look like in the springtime. We found orchids of several genera, many ferns, trilliums and their strange relative *Paris*, Jack-in-the-pulpit, baneberries, etc. I really love such plants and I could hardly contain myself.

Later, after lunch and a tour of the adjacent, ultra-modern museum commemorating Hokkaido's centennial, we set out across the city for Mt. Moiwa, a low peak where Charles Sargent had collected nearly a century before. We ascended the mountain by cable car and had a close look at the forest canopy below with the whitish flower clusters of *Aralia elata* and the huge leaves of *Magnolia hypoleuca* standing out conspicuously. The descent was an easy trail through a forest basically similar to that at Nopporo, but our collecting was limited since daylight was fading fast.

The next morning after touring the botanic garden, we thanked Dr. Ui profusely and boarded the train for Urakawa on Hokkaido's southeastern coast. The countryside was beautiful, reminiscent in many places of southeastern Pennsylvania where I grew up. As we approached Urakawa, the Hidaka Range, among Japan's oldest mountains geologically, came into view. We tried to pick out Mt. Apoi, a peak isolated from the main range that we were to climb the following day. Mt. Apoi is a remarkable mountain, slightly more than 800 meters high, but with an alpine zone and several endemic plants at its summit. The low alpine zone is due to the almost continuous fog that keeps the mean temperature low throughout the year.

We were met by a very jovial Mr. Minowa and ushered around to meet various local governmental and forestry officials. Evidently westerners do not often visit Urakawa. Quite exhausted, we were finally taken to our inn, the only *ryokan* (or Japanese inn) in which we stayed the entire trip. I was shown my room but told that I could not occupy it because dinner was being set up. I insisted on a bath, and upon returning found a seafood feast set up, attended by Mr. Minowa, the governor of the district, and Mr. Uchida, our guide for the following day. We had a most enjoyable evening, discussing all sorts of problems through Katsu's translation, while our cups were continually refilled with saki and other libations.

We mostly looked at our breakfast the next morning, particularly the bowl of fern fiddleheads with what looked like bacon but turned out to be whale meat. Not knowing our condition, the cook was disappointed that we had not eaten more. The next morning we had eggs.

Much too early on a dreary September 8 we set out for Mt. Apoi. The rain was light but persistent, and soaked us through, except for Mr. Uchida who had a distinct knack for remaining dry. We drove to the edge of the forest and proceeded to climb. The vegetation was basically similar to that at Nopporo. *Viburnum furcatum* was abundant and laden with its beautiful red drupes and we could not resist making a large collection. Several shrubs new to us added a bit of excitement. Our first large-leaved rhododendron, *R. brachycarpum*, was common at lower elevations, and although the capsules were green and scarce, we collected a few. Other members of the Heath Family included a species of *Menziesia*, a genus of deciduous shrubs

with flowers resembling those of blueberries, and *Vaccinium oldhamii*, our first of many encounters with this beautiful blueberry that now was taking on its burgundy autumn coloration. The maroon fruits in drooping clusters were just ripe enough for collection.

In a clearing along the trail I stopped to photograph a clump of the very beautiful *Ophelia tetrapetala* var. *yezoalpina*, an annual member of the Gentian Family with pale blue, spotted flowers. Focusing with a wet view-finder and fogged-up eyeglasses was frustrating enough, but the last straw was to find that I was out of film after taking just one picture. Soon afterward, Steve discovered that he was out of film as well. (The day was not a good one for photography anyway.)

The climb was an easy one, and the trail was good. As we ascended, the deciduous trees became admixed with *Pinus parviflora*, the Japanese White Pine. This area is one of the few places on Hokkaido where this species is native. We stopped to collect the "berries" of *Juniperus chinensis* var. *sargentii*, a low growing juniper, and soon came abruptly out of the forest and onto a very welcome, dry trail-side shelter perched at the foot of a treeless ridge leading to the summit of the mountain. Exciting new plants were all about us. We soon made collections of dwarf forms of *Berberis amurensis* var. *japonica* and *Lespedeza bicolor*, the latter frustrating us as before with immature fruits, but we collected them anyway. A mountain ash, *Sorbus sambucifolia* var. *pseudogracilis*, only 3 feet tall with clusters of large red-orange berries, was one of the most beautiful ones I had ever seen.

The climbing now became harder and we were lucky to find many interesting plants. The Japanese Stone Pine, *Pinus pumila*, a low, timberline species, was abundant, but we found few cones with seeds. We did make a good collection of *Rhododendron dauricum*, one of our favorite harbingers of spring back at the Arnold Arboretum, as well as of a prostrate form of *Potentilla fruticosa*, the Bush Cinquefoil. Well below the summit were 2-foot fruit-laden shrubs of one of our main objectives, *Betula apoensis*, a dwarf birch restricted in distribution to this mountain. With the summit yet a half-mile distant and the clouds clearing to reveal magnificent views of the Hidaka Range and the Pacific, we cursed our lack of film and decided to go no further.

Mr. Uchida suggested another route down, following the mostly treeless scrub for quite a distance. We soon found *Ilex rugosa*, *Leucothoe grayana* var. *oblongifolia*, *Ledum palustre* var. *diversipilosum*, *Juniperus communis* var. *nipponica*, and a large selection of my favorite group of herbaceous plants, the Lily Family. In a small area I found at least two species of *Veratrum* (false hellebore), *Lilium medeoloides*, *Tofieldia nutans* var. *kondoi*, an endemic species, *Convallaria keiskei*, the Japanese Lily of the Valley, and *Clintonia udensis*, with beautiful black fruits.

We worked our way down, with Mr. Uchida in the lead making

various noises to warn bears of our presence (The Eurasian Brown Bear is still relatively common here.). After a very late lunch at Mr. Uchida's headquarters, the Experimental Garden for the Department of Forestry of the Hidaka District, we looked at the plantings surrounding the station. Many exotic trees were being tested there as candidates for a reforestation program, but native plants were well represented as well. Our best collection was of undoubtedly the most beautiful species of *Euonymus* I have ever seen, *Euonymus macropterus*, a small tree covered with long, pendent red fruits, each segment with a slender wing.

The next morning Mr. Yojuuro Sato, a college friend of Katsu's who is now teaching high school on Hokkaido, joined us for a short collecting trip to one of the river valleys northwest of Urakawa. The rain was heavy and the plants mostly unexceptional. We did have our first encounter with *Staphylea bumalda*, the Japanese species of bladdernut, growing almost as a weed shrub. But it was wonderful to gaze over the forests and to see the treetops here and there splotched with the white-variegated leaves of *Actinidia kolomikta*, a woody vine closely related to *A. chinensis*, the plant that produces the familiar "Kiwi Fruit" we can occasionally buy in supermarkets in the United States.

After expressing our sincerest thanks and fond farewells to our hosts in Urakawa, we headed north on a scenic, narrow road toward Asahikawa in the center of Hokkaido. Mr. Sato's station wagon was loaded with grapes from his father's orchard — wonderfully sweet small grapes of the cultivar 'Delaware' from the United States, but seedless because each inflorescence had been hand-dipped in gibberellic acid. We had a feast, both of these grapes and hybrid melons which were like a cross between a cantaloupe and a honey-dew.

In the late afternoon we stopped for an hour or so at the Tokyo University Forest in Hokkaido, an experimental station near the town of Yamabe. Our most gracious host, Mr. Kurahashi, served us a rather untraditional Japanese tea complete with tomatoes and corn on the cob, fresh from the garden, before showing us around the plantation. Many native woody plants were represented, and we collected our first material of *Alangium platanifolium*, a plant very high on our list of desiderata. This low, shrubby plant with trilobed leaves and black fruits, in a family close to the dogwoods, is very rare in cultivation in the United States.

Another item of interest was a fine row of the true Monarch Birch, *Betula maximowicziana*. This plant has recently caused quite a stir in the United States since it has been touted as a white-barked birch resistant to the devastating bronze birch borer. Unfortunately the trees on which the observations were made were misidentified; as it turns out, most were the so-called Monarch Birches in the United States, including those at the Arnold Arboretum. The plant is resistant to the borer, but it does not have really white bark. Those



Mr. Akio Kurahashi and one of his assistants at the Tokyo University Forest in Hokkaido, preparing a rather untraditional Japanese tea.

we had seen in the wild had mostly silver-gray bark, although those here in Hokkaido were the best we encountered in Japan, with bark approaching white.

Just before we left we were ushered into what turned out to be the strangest museum I have ever seen: A dank, dark, concrete room lined with ceiling-high trunks and the corresponding cross-sections of what used to be magnificent specimens of the most important forest trees of Hokkaido. Who would have imagined two species of alders (*Alnus japonica* and *A. maximowiczii*) with trunks nearly 3 feet in diameter?

The last part of our journey, with the sun setting, was most enjoyable: Small towns; rolling farmland with fields of rice and melons growing beautifully at a latitude further north than that of Boston; the volcanic massif of Tokachi with steaming vents; and finally Asahikawa, Hokkaido's second largest city, pleasant and bustling, with a good room and a wonderful meal in a non-tourist restaurant complete with a traditional Japanese folk-singer.

To me, the next day, September 10, was the best of the trip. Our objective was Daisetsu-san National Park, encompassing the Daisetsu massif with one of the peaks, Asahi-dake, at 2345 meters the highest point on the island. As soon as we reached the outskirts of Asahikawa, the mountain loomed before us, the steaming vents plainly visible. Soon after we started the drive up the mountain, we saw a plant of *Sambucus sieboldiana* heavy with fruit. This elderberry is closely related to our own native *S. pubens*. A bonus at this stop was *Spiranthes sinensis*, one of the loveliest wildflowers we encountered. This orchid, the only Japanese species of *Spiranthes*, closely resembles our native ladies tresses, except that the flowers, arranged in a long spiral spike nearly 10 inches long, are pink rather than creamy white.

Climbing higher, we drove through a forest completely different from those we had seen before. The aspect was much like that of the subalpine forests of the western United States. Conifers, primarily *Picea jezoensis*, were mixed with deciduous trees, the commonest being *Acer ukurunduense* and *Betula ermanii*. The road ended at the ski lodge, and we had to rely on a cable car to take us to the alpine zone.

The views from the cable car were such that we could hardly contain our anticipation. For the most part the Japan we saw is often beautiful, but seldom spectacular. However, the view after we left the car and walked over a small rise was breathtaking. The peaks themselves set the backdrop, with the steam from the fumaroles near their base rising eerily to blend with the fog above. The half-mile in between was a gently rolling plateau covered with alpine vegetation. The edges, basically the treeline, were rimmed with *Pinus pumila*, *Acer ukurunduense* and *Sorbus matsumurana*, the last two with their autumn foliage brilliant orange and scarlet.

Although *Gentiana triflora* var. *japonica*, a bottle-type gentian with flowering shoots nearly 2 feet tall, added a touch of color, very few plants in the alpine vegetation were in bloom at this season. The vegetation is dominated by shrublets of a wide variety of species, mostly members of the Heath Family. The most conspicuous plant, however, was a species of the Rose Family, *Sieversia pentapetala*, a woody segregate of *Geum*, whose fuzzy fruit aggregates stood out above the green.

The alpine zone of Mt. Daisetsu is carefully patrolled by uniformed rangers, and we were warned by our hosts that we must not collect any plant material. Thoroughly frustrated, we were poking about on our hands and knees when one of the rangers came to investigate. As it turned out, he had a great appreciation for the plants he was protecting. Apparently overjoyed to find kindred spirits, he went about gathering seeds for us. After about an hour we decided to climb up for a closer look at the fumaroles, and when we returned,

The alpine zone of Mt. Daisetsu, showing the active fumaroles. The shrubs in the foreground are Pinus pumila and Sorbus matsumurana.

our ranger friend had several more packets of seeds, neatly labeled in Japanese, waiting for us.

Some of the plants we collected were as follows: Several species of *Vaccinium*, including *V. vitis-idaea*, the Mountain Cranberry, an old friend from the alpine areas of New England, and *V. praestans*, a prostrate species with large, red fruits; *Gaultheria miqueliana*, a relative of our Checkerberry but with large white fruits; *Loiseluria procumbens*, the Alpine Azalea of the New Hampshire mountains, but here growing more upright; *Phyllodoce nipponica*, still with a few pink flowers; *Rhododendron aureum*, a dwarf, yellow-flowered species that I can hardly wait to see in bloom; *Harrimenella stelleriana* (a segregate of *Cassiope*) and *Arcterica nana*, two dwarf species of the Heath Family; and a lovely alpine blackberry (*Rubus*) which we could not identify.

As we worked our way down the mountain we were appalled to find that *Sasa kurilensis*, the scourge of Hokkaido, was spreading even into the lower areas of the alpine zone. The subalpine forest was lovely, very open with many herbaceous plants of great interest, although few were in bloom. The most conspicuous was *Lysichiton camtschatcense*, a member of the Arum Family whose western Ameri-



can counterpart is called the Western Skunk Cabbage. The large leaves resemble those of our native Skunk Cabbage of a related genus. The ripe fruit aggregates were all that remained of the inflorescence, with its large white, calla-like spathe.

In our searches on Mt. Daisetsu we failed to find one of our objectives, *Bryanthus gmelinii*, a rare, endemic Japanese shrublet of the Heath Family. But Mr. Sato knew of a nursery near the base of the mountain that specialized in local alpinists. We paid the establishment a visit on our way back to Asahikawa, and among many other interesting plants we found a *Bryanthus*.

The next day, after a few hours of collecting, we boarded the train for a seven-hour trip to Hakodate, Hokkaido's main port and one of the first Japanese cities opened to foreign commerce in the late 1850's. That night Katsu and I took a cable car to the top of Mt. Hakodate, overlooking the city, for a magnificent view. Our collecting the next day, in the coastal scrub near the city, was interesting but we encountered few new plants.

On September 13, we boarded the ferry for Aomori on Honshu, the Japanese "mainland." The boat was spacious and comfortable, a good thing since the trip took about four hours. Dr. Kankichi Sohma and one of his graduate students, Mr. Masamichi Takahashi, our hosts for the second portion of our trip, met us when we landed. Katsu had to return to Hiroshima, so we made arrangements for meeting him again in Nagoya before bidding farewell.

Dr. Sohma, a palynologist at Tohoku University in Sendai, was driving a university jeep into which we loaded all our gear before heading south for Mt. Hakkoda. Our destination was Tohoku University's biological laboratory on the slopes of the mountain. The laboratory itself turned out to be a delightful place. The main building was rustic inside and out, with a large western-style dormitory room, a small kitchen, and a traditional style room which we used as a combination working-dining room. Surrounding the building was a small but fine botanic garden, with plants native to the region interspersed amongst the natural vegetation. Most of the plants were labeled with their Japanese and Latin names.

Dr. Sohma suggested that we take a bath in the hot springs nearby before supper. As he said that it was one of the few traditional baths remaining in this part of Japan, we were excited and curious. When we got inside the men's dressing room we found a window leading directly to the comparable room for women so we suspected that the baths were coed. Inside the baths themselves, the scene was eerie in the extreme — a huge room paneled with rough-hewn timbers, dimly lit and very steamy, smelling strongly of sulphur, with two very large pools filled with milky-colored water and mostly old Japanese of both sexes. We slipped into the first bath, whose water had been slightly cooled, and tried to relax. The bath was soothing, and we soon decided to try the other pool, whose water had been heated so

that it was possible for me to stay in only for a few minutes at a time.

Mr. Takahashi left before we did, and when we got back to the laboratory he was busily cooking supper. Since Steve and I had trouble remembering his name, it was suggested that we call him "Hashi," which appropriately was the word for the utensils we call chopsticks. Both Hashi and Dr. Sohma spoke English well and were extremely personable men, so we had a very enjoyable, as well as profitable, time with them.

The next morning, September 14, we climbed Mt. Hakkoda. Like Mt. Daisetsu, this is a volcanic massif with several peaks. However, there are no active vents and the hot springs are about the only evidence of volcanic activity. The trail we took led to the highest peak, at 1585 meters above sea level. This was a good day for collecting, since we encountered many new plants. The vegetation at the beginning of the trail was mostly deciduous forest with *Sorbus commixta*, *Acer tschonoskii*, *Acer ukurunduense*, *Cornus controversa*, and *Acanthopanax sciadophylloides*; the last, a member of the Aralia Family with large, palmately compound leaves. The shrubs again were mostly members of the Heath Family, including several azaleas, blueberries and species of *Menziesia*; in addition, *Ilex sugerokii* var. *brevipedunculata*, an evergreen holly, and *Lindera umbellata* var. *membranacea*, a relative of our spicebush, were abundant. As we climbed, *Abies mariesii*, a species of fir with dull purple cones, became prevalent. Mt. Hakkoda is the northern limit of its distribution.

This day we also had our first of many encounters with the phenomenon of Japanese high school students on holiday. Particularly in the fall, students from all over Japan, dressed in their black and white uniforms, are taken en masse on field trips. This day they were rather like ants and just as annoying. Besides detracting from the pristine beauty and seeming isolation of Mt. Hakkoda, they wasted much of our time by causing us to step off the narrow trails as they passed in seemingly unending streams.

We persevered, and finally lost the students as we neared the summit. Unfortunately, at the same time the weather deteriorated. The gray skies finally did more than threaten, and in the chill at the top of the mountain sleet fell as we tried to view the old crater through the mist.

The woody alpine vegetation was similar in composition to that on Mt. Daisetsu, except that here *Phyllodoce aleutica*, with creamy flowers, replaced *P. nipponica*. The herbaceous flora was quite new to us, however. On our descent we came across a large area where the snow had melted relatively recently, and many plants were in bloom. One of the most wonderful was *Shortia soldanelloides*, its pink, frilled flowers reminiscent of those of its famous American counterpart. This rare and notoriously difficult plant in American gardens was almost a weed all over the alpine zone on Mt. Hakkoda, even growing in the middle of the trail. Quite common also was a



Phyllodoce aleutica, a dwarf shrub of the Heath Family in the alpine zone on Mt. Hakkoda in northern Honshu. The urn-shaped, creamy-colored flowers are about 3/8-inch long.

brilliant blue alpine gentian, *Gentiana nipponica*, and a relative of the gentians, *Fauria crista-galli*, with its clusters of white star-shaped flowers and kidney-shaped basal leaves. *Metanarthecium luteo-viride*, an endemic Japanese member of the Lily Family, and a diminutive primrose, *Primula nipponica*, were in abundant fruit and I could not resist collecting them.

In the subalpine zone we came upon vast areas of a very unusual type of vegetation — a peat bog almost completely covered with a mat of grasses and sedges but interspersed here and there with orchids and several members of the Lily Family. Traversing the area was easy because of a very extensive and beautifully constructed boardwalk. Occasionally we came upon clumps of shrubs, mostly *Pinus pumila* and a natural hybrid, *P. × hakkodensis* (*P. pumila* \times *P. parviflora*). Our most exciting find was a dwarf witch hazel, *Hamamelis japonica*. Hopefully, the seeds we collected from it will produce equally dwarf plants.

Heading south the next day, our ultimate destination being Sendai, we paused to make a collection of *Tsuga diversifolia*, one of the two Japanese hemlocks, which we found growing at the northern limit of its range. At Tsuta Hot Springs on the lower slopes of Mt. Hak-

Drs. Stephen Spongberg and Kankichi Sohma in the beautiful forests typical of the Lake Towada area on northern Honshu. The commonest trees in the forest were Magnolia hypoleuca, Fagus crenata, and Aesculus turbinata.

koda, we stopped longer to admire the truly magnificent forests where the dominant trees were *Fagus crenata*, (a species of beech), *Magnolia hypoleuca*, and *Aesculus turbinata*, the Japanese species of horse chestnut. All of these species have a smooth silvery-gray bark, and the last two have huge leaves. The undergrowth was sparse and open, everything combining to make a forest of uniquely beautiful character from the floor to the canopy. It was perfectly quiet and beautifully sunny, devoid of tourists or schoolchildren — all in all a wonderful experience for one who loves forests.

Still further south we collected along the shores of Lake Towada, a deep and very blue lake occupying the caldera of a long-gone volcano, much like Crater Lake, Oregon, in our own country. The forests here were similar but not quite so beautiful as those described above.

After spending the night in the city of Morioka, we collected part of the next day (September 16) on Mt. Hayachine, a non-volcanic mountain with serpentine rocks and several unusual plants. On our way to Sendai we stopped to inspect a traditional thatch-roofed farmhouse, a rare sight in Japan these days.

For the next several days our base was Sendai. We went to several interesting localities with Dr. Sohma and/or Hashi, but space will allow the discussion of only one, the northeastern part of Nikko National Park. This day, September 17, did not yield a large number



of collections, but the ones we did make were among the most interesting of the entire trip. The forests of the central part of Honshu are very rich, many of the more southern elements reaching their northern limit here. Within a few miles of Kashi Hot Springs, we found nine species of maples, unfortunately with very few in fruit. Here we saw our finest wild specimens of *Stewartia pseudocamellia*, but again without fruit. We did manage to make good collections of *Euptelea polyandra*, an unusual tree of uncertain classification, and one rare in cultivation but here growing almost as a weed. Our main objective this day was *Trochodendron aralioides*, a primitive, evergreen tree with its northernmost high elevation station in this area. To reach it we had to climb nearly to the top of Mt. Kashi on an easy trail through beautiful forest. On the way were a number of plants of *Magnolia salicifolia*, of great interest to Steve because these were shrubby, while most plants of this species cultivated in the United States are treelike. Reaching the ridge, we could not help but notice the similarity in the aspect of the vegetation to that of like situations in the Appalachians. Only pines were absent. We found the *Trochodendron* as the sun began to get quite low and we searched desperately for fruits. Finding none, in desperation we dug up a few rooted layers. As we were about to head down we found a few plants of another broad-leaved evergreen that none of us could identify. A few layers of this "mystery plant" were taken also, and we will have to wait until it flowers to find out what it is.

The morning of September 22 was our last in Sendai. Our farewell to Hashi and Dr. Sohma was a sad one since we had become good friends. I still look back in amazement at the time and effort these two men put into helping two complete strangers.

Most of the two days in Tokyo were spent packing things to be sent home as we would be taking the train to Sukuoka, on the island of Kyushu, before catching a flight for Seoul. Our party had now grown to three with the arrival of Steve's wife on September 24.

The Japanese trains were as efficient and comfortable as universally reported, especially the Shinkan-sen or Bullet Train, with a maximum speed of 120 miles per hour. On September 26 we arrived in Nagoya where Katsu and his father were waiting for us. We visited the Nagoya Botanical Garden briefly and were able to collect a few plants in a patch of natural woodland there. The next day we visited the elder Kondo's garden — a remarkable place. Mr. Kondo is interested in carnivorous plants and he has amassed a very good collection which he grows in a natural boggy area about an hour's drive from Nagoya. We were amazed to find Venus Flytraps growing happily and reseeding themselves, as well as many species and hybrids of our native pitcher plants.

On the evening of September 27 we arrived in Kyoto, spending the next day sightseeing in this wonderful city. Always on the go, we took the train to Hiroshima on September 29 and spent an en-

joyable afternoon at the Botanic Garden there. At that time the garden was less than a year old and it was hard to believe the progress in such a short time. It features the largest conservatory in all of Japan, and it is well planted with remarkably well established plants; even orchids have started reseeding themselves. The research program spearheaded by the Director, Mr. Karasawa, an authority on terrestrial orchids, is well established; so is the educational program which, we can proudly say, was developed with help and advice from the Arnold Arboretum.

On September 30 we met Katsu's young family before saying goodbye and leaving for Fukuoka. It was a sad moment. Besides providing more assistance than we can ever adequately thank him for, Katsuhiko Kondo has become a good friend.

Itinerary in Japan with plants collected at each site

2 September — Arrived in Tokyo.

3 September — Sightseeing and shopping in Tokyo. Met Katsuhiko Kondo.

4 September — Took bus tour to Nikko and Nikko National Park.

Acer japonicum

Weigela hortensis

5 September — Flew from Tokyo to Sapporo. Visited botanical garden of Hokkaido University in Sapporo, and Government Forest Experimental Station, Hokkaido Branch, near Sapporo.

Acer mono

Magnolia hypoleuca

Acer palmatum

Magnolia kobus

Actinidia arguta

Quercus mongolica

Aralia cordata

Vitis coignetiae

6 September — Visited Nopporo Natural Forest near Sapporo.

**Abies sachalinensis*

**Photinia villosa* var. *laevis*

Acer japonicum

Picrasma quassioides

**Alnus hirsuta*

**Prunus grayana*

**Alnus japonica*

Prunus ssiori

**Alnus maximowiczii*

**Rosa acicularis* var. *nipponensis*

**Betula grossa*

Rubus phoenicolasius

Carpinus cordata

Rubus sp.

Cephalotaxus harringtonia var. *nana*

Skimmia japonica

Daphniphyllum macropodum var. *humile*

**Sorbus commixta*

Euonymus oxyphyllus

Viburnum wrightii

Paeonia japonica

— Visited Hokkaido Centennial Museum. Took cable car up Mt. Moiwa, near Sapporo.

Betula ermanii

Vaccinium smallii

Rhus sp.

Vaccinium sp.

7 September — Visited Botanical Garden in Sapporo. Took train from Sapporo to Ura-kawa. Visited with local officials in Urakawa.

* Cultivated material.

8 September — Climbed Mt. Apoi.

Acer japonicum
Alnus maximowiczii
Betula apoiensis
Clintonia udensis
Ilex rugosa
Juniperus communis var. *nipponica*
Juniperus chinensis var. *sargentii*
Ledum palustre var. *diversipilosum*
Lespedeza bicolor
Leucothoe grayana var. *oblongifolia*
Menziesia sp.
Pinus parviflora
Pinus pumila
Potentilla fruticosa
Prunus nipponica

— Visited Experimental Garden for the Department of Forestry of Hidaka District in Urakawa.

**Acer ukurunduense*
 **Euonymus macropterus*
 **Euonymus* sp.

Quercus mongolica
Rhododendron brachycarpum
Rhododendron dauricum
Rosa acicularis
Rubus crataegifolius
Sorbaria sp.
Sorbus commixta
Sorbus sambucifolia var. *pseudogracilis*
Spiraea miyabei
Vaccinium oldhamii
Vaccinium vitis-idaea
Viburnum furcatum
Viburnum sp.
Zanthoxylum piperitum

9 September — Collected around Urokorethu, Urakawa Mountain.

Actinidia polygama
Juglans ailanthifolia
Metaplexis japonica
Picrasma quassioides
Prunus sp.

Rubus sp.
Staphylea bumalda
Stephanandra sp.
Tilia sp.

— Traveled by automobile to Asahikawa; enroute stopped at Tokyo University Forest in Hokkaido near Yamabe.

**Abies sachalinensis*
 **Acanthopanax divaricatus*
 **Acanthopanax senticosus*
 **Aesculus turbinata*
 **Alangium platanifolium* var. *trilobum*
Alnus hirsuta
 **Betula platyphylla*
Carpinus cordata
Cephalotaxus harringtonia var. *nana*

**Euonymus planipes*
 **Euonymus sieboldianus*
 **Juglans ailanthifolia*
 **Ribes latifolium*
 **Spiraea cantoniensis*
 **Spiraea* sp.
 **Styrax obassia*
 **Symplocos chinensis*
 **Vaccinium uliginosum*

10 September — Collected on Asahi-dake, Mt. Daisetsu, Daisetsu-san National Park.

Acer ukurunduense
Arctica nana
Betula ermanii
Empetrum nigrum var. *japonicum*
Euonymus sieboldianus
Gaultheria miqueliana
Harrimanella stelleriana
Ledum palustre var. *diversipilosum*
Loiseluria procumbens
Phyllodoce nipponica
Picea jezoensis
Pinus pumila

Potentilla miyabei
Rhododendron aureum
Rubus sp.
Sambucus sieboldiana
Sieversia pentapetala
Sorbus matsumurana
Spiraea betulifolia
Streptopus sp.
Vaccinium hirtum
Vaccinium praestans
Vaccinium uliginosum
Vaccinium vitis-idaea

11 September — Collected in Northern Plant Garden, Asahikawa.

Alangium platanifolium var. *trilobum*
 **Bryanthus gmelinii*

Caulophyllum robustum
Cephalotaxus harringtonia var. *nana*

* Cultivated material.

Gaultheria adeno-thrix*Houttynia cordata**Parthenocissus* sp.

— Traveled by train to Hakodate.

*Phellodendron amurense**Prunus ssiori***Tiarella polyphylla*

12 September — Visited Forest Experiment Station at Ohno, near Hakodate.

Collected in coastal scrub in Akukawa-cho, near Hakodate.

Crataegus jozana (?)*Ilex macropoda**Pinus thunbergii**Quercus dentata**Quercus dentata* × *mongolica**Quercus mongolica**Smilax* sp.*Staphylea bumalda**Vaccinium oldhamii**Viburnum dilatatum**Viburnum* sp.*Weigela hortensis*

— Collected along roadside in Mitsumori-cho, near Hakodate.

Ampelopsis brevipedunculata var.*heterophylla**Ampelopsis* sp.*Corylus sieboldiana**Maackia amurensis* var. *buergeri**Prunus grayana**Viburnum opulus* var. *calvescens**Vitis coignetiae*

13 September — Traveled by ferry to Aomori on Honshu; met Dr. Sohma and Mr. Takahashi. Traveled by jeep to the Mt. Hakkoda Biological Laboratory of Tohoku University; enroute stopped at entrance to Hachimantai-Towada National Park to collect. (Aomori Pref.)

*Akebia trifoliata**Betula ermanii**Sorbus commixta**Tilia miqueliana*

14 September — Climbed Mt. Hakkoda, Aomori Pref.

*Abies mariesii**Acanthopanax sciadophylloides**Acer japonicum**Acer tschonoskii**Acer ukurunduense**Alnus maximowiczii**Arctica nana**Cornus controversa**Daphniphyllum macropodum* var. *humile**Gaultheria adeno-thrix**Gaultheria miqueliana**Hamamelis japonica**Ilex sugerokii* var. *brevipedunculata**Lindera umbellata* var. *membranacea**Loiseluria procumbens**Menziesia ciliicalyx* var. *multiflora**Menziesia pentandra**Phyllodoce aleutica**Prunus grayana**Quercus mongolica**Rhododendron brachycarpum**Rubus vernus**Tripetaleia bracteata**Vaccinium japonicum**Vaccinium ovalifolium**Weigela hortensis*

15 September — Collected in vicinity of Mt. Hakkoda Biological Laboratory.

Daphniphyllum macropodum* var. *humile*Ilex leucoclada*

— Traveled by jeep to Tsuta Hot Springs; enroute stopped to collect on slopes of Mt. Hakkoda.

Tsuga diversifolia

— Collected in forest surrounding Tsuta Hot Springs, Aomori Pref.

*Aesculus turbinata**Daphniphyllum macropodum* var. *humile**Hyrangea macrophylla**Ilex leucoclada**Pterocarya rhoifolia**Vaccinium smallii**Viburnum urightii*

— Drove to Lake Towada and collected in the vicinity. (Aomori Pref.)

*Acer japonicum**Acer mono* var. *mayrii**Aucuba japonica* var. *boreale**Euonymus* sp.*Lindera umbellata* var. *membranacea**Pterocarya rhoifolia**Stachyurus praecox*

* Cultivated material.

— Drove to Morioka to spend the night; enroute did sightseeing around Lake Towada and collected along roadside near Yuze, Akita Pref.

Ampelopsis brevipedunculata var.

brevipedunculata

Berchemia racemosa

Lespedeza bicolor

Quercus serrata

Rhus javanica

Stachyurus praecox

Viburnum dilatatum

Wisteria floribunda

16 September — Drove from Morioka to Mt. Hayachine; climbed into alpine zone. (Iwate Pref.)

Acer distylum

Acer tschonoskii

Acer ukurunduense

Betula corylifolia (?)

Betula ermanii

Clematis apiifolia

Juniperus chinensis var. *sargentii*

Juniperus communis var. *nipponica*

Leucothoe grayana var. *oblongifolia*

Lonicera sp.

Rhododendron tschonoskii

Thymus sp.

Tsuga diversifolia

— Drove from Mt. Hayachine to Sendai.

17 September — Drove from Sendai to Nikko National Park; collected along roadside and climbed Mt. Kashi, behind Kashi Hot Springs, Fukushima Pref.

Acer cissifolium

Euptelea polyandra

Hamamelis japonica

Hydrangea macrophylla

Leucothoe sp.

Magnolia salicifolia

Meliosma tenuis

Skimmia japonica

Trochodendron aralioides

— Returned to Sendai.

18 September — Collected on the grounds of the Medical School of Tohoku University, Sendai, Miyagi Pref.

**Camellia* sp.

**Distylium racemosum*

Ardisia japonica

Aucuba japonica

**Betula platyphylla*

Buckleya lanceolata

Enkianthus campanulatus

Lespedeza homoloba

Lyonia elliptica

**Trachycarpus fortunei*

Neolitsea sericea

Rhododendron semibarbatum

**Spiraea nipponica* f. *nipponica*

**Spiraea nipponica* f. *rotundifolia*

Viburnum phlebotrichum

Zanthoxylum ailanthoides

19 September — Drove from Sendai to Mt. Daito, Miyagi Pref.

Abelia spathulata

Akebia trifoliata

Aucuba japonica var. *boreale*

Berchemia racemosa

Callicarpa sp.

Castanea crenata

Clematis maximowicziana

Clematis sp.

Cryptomeria japonica

Deutzia crenata

Helwingia japonica

Lespedeza bicolor

Lespedeza homoloba

Pyrus calleryana var.

dimorphophylla (?)

Sapium japonicum

Schisandra repanda

Staphylea bumalda

Symplocos chinensis

Viburnum sp.

Weigela sp.

— Returned to Sendai.

* Cultivated material.

20 September — Drove to Miyato, near Matsushima, Miyagi Pref.

<i>Ardisia japonica</i>	<i>Orixa japonica</i>
<i>Boehmeria biloba</i>	<i>Paederia scandens</i>
<i>Buckleya lanceolata</i>	<i>Pinus densiflora</i>
<i>Callicarpa mollis</i>	<i>Pinus thunbergii</i>
<i>Camellia japonica</i>	* <i>Pittosporum tobira</i>
<i>Corylus sieboldiana</i>	<i>Rhododendron semibarbatum</i>
<i>Diospyros lotus</i>	<i>Rhus trichocarpa</i>
<i>Euonymus radicans</i>	<i>Torreya nucifera</i>
<i>Eurya japonica</i>	<i>Trachelospermum asiaticum</i>
<i>Helwingia japonica</i>	<i>Tripetaleia paniculata</i>
<i>Juniperus chinensis</i>	* <i>Viburnum awabukii</i>
<i>Ligustrum ovalifolium</i>	<i>Viburnum wrightii</i>
<i>Liriope minor</i>	<i>Zanthoxylum piperitum</i>
<i>Neolitsea sericea</i>	

— Returned to Sendai.

21 September — Drove to Yamagata Prefecture on the Sea of Japan side of Honshu; collected in the mountain behind Yamadera.

<i>Betula schmidtii</i>	<i>Quercus acutissima</i>
<i>Clethra barbinervis</i>	<i>Styrax obassia</i>
<i>Deutzia</i> sp.	<i>Thujopsis dolabrata</i>

— Drove to Yamadera; visited the temple there and collected in the vicinity.

<i>Acer cissifolium</i>	<i>Ilex serrata</i>
<i>Betula platyphylla</i>	<i>Lindera praecox</i>

— Returned to Sendai.

22 September — Took train from Sendai to Tokyo.

23 September — Spent the day in Tokyo; met with Professor Hara.

24 September — Spent the day in Tokyo; "Happy" Sponberg arrived.

25 September — Took bus tour to Kamakura to see the giant Buddha, and then continued on to Hakone; visited Art Museum and adjacent garden.
Returned to Tokyo.

26 September — Traveled by train to Nagoya; visited the Nagoya Botanical Garden.

<i>Ilex serrata</i>	<i>Vaccinium</i> sp.
<i>Quercus</i> sp.	

— Visited Chrysanthemum show at Nagoya Castle.

27 September — Drove from Nagoya to Toyota; visited the carnivorous plant garden of Mr. Kondo.

<i>Ilex serrata</i>	<i>Quercus</i> sp.
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— Returned to Nagoya. Traveled by train from Nagoya to Kyoto.

28 September — Sightseeing in Kyoto.

29 September — Traveled by train from Kyoto to Hiroshima. Visited the Hiroshima Botanical Garden.

Alnus pendula

30 September — Sightseeing on Miyajima Island. Traveled by train from Hiroshima to Fukuoka.

1 October — Flew from Fukuoka to Seoul.

* Cultivated material.

Summer Bloom in the Arnold Arboretum

by IDA HAY BURCH

A guidebook comprised of a series of self-guided walks through the living collections of the Arnold Arboretum is currently under preparation by the staff. Tours organized around topics such as the seasons, twenty of the finest individual trees, seed dispersal, the meadow, plant introductions of the Arboretum, and more will be included.

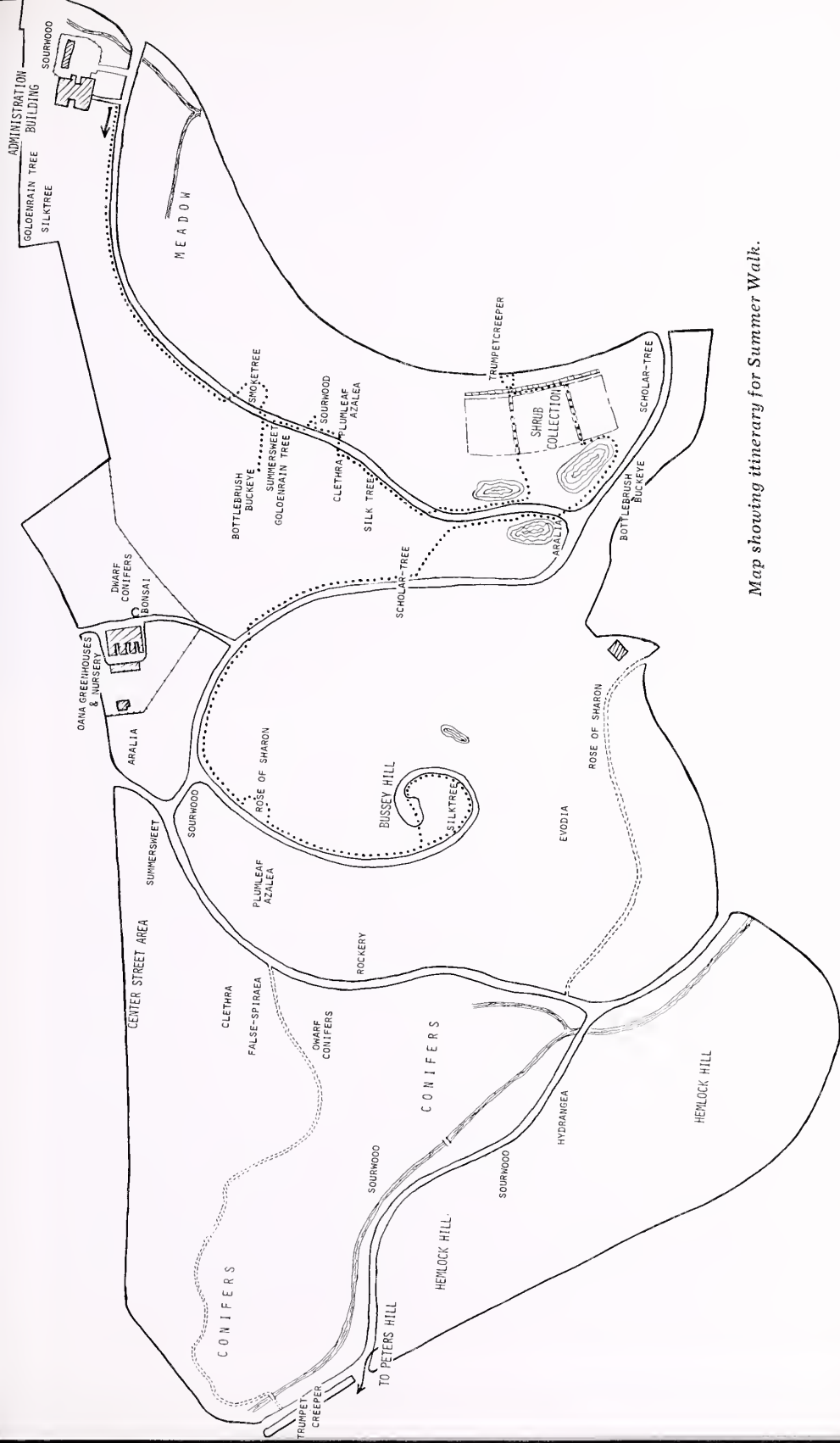
The following walk, intended for July and August, has been selected to give Friends of the Arnold Arboretum and other *Arnoldia* readers a chance to sample a self-guided tour this summer. We hope you will stop in at the Administration Building to give us your comments, or drop us a line. This will help us in the preparation of other walks. Ed.

While summer is vacation time for most people, it is the season of most active growth for the plants in the Arboretum. The majority of temperate woody plants here bloom in spring, which is the principal reason for the Arboretum's greater popularity at that season. In summer, when maximum heat and light are available, they are using this energy to mature fruit and form buds for next spring's flowering.

In summer there are few groups that are as showy as the forsythias, cherries, lilacs or crabapples. Summer-blooming trees and shrubs may be a neglected group horticulturally because of their more subtle displays, but there are many here to see. A number bloom over quite long periods — a month or more for some. Several of the shrubs in flower at this time formed their flower-buds since growth started this season; that is, their flower-buds do not over-winter as do those of spring blooming species. For some, much of the wood dies back each winter. Many of our summer blooming woody plants are members of unusual plant families, families that are found predominantly in tropical regions. All of the plants highlighted in this walk are of value in gardens for their color in summer, which is relatively rare among trees and shrubs hardy in this climate.

Visitors to the Arboretum will find that summer is a good time to observe the color and texture of foliage and the quality of shade produced by many spring-flowering trees and shrubs, and to evaluate their effectiveness in the landscape. Some plants definitely have more character or interest in their summer foliage than others.

Starting down the Meadow Road from the Administration Building, look across at the meadow, which is now at its height of color. (You may want to take the Meadow Walk at this time.) Up on the hill at the end of the flat lawn area next to the building are two of the important summer-blooming trees, the yellow-flowered, green-fruited Goldenrain Tree and the Silktree with its fuzzy, pink flower clusters.



Map showing itinerary for Summer Walk.

Appreciate these from a distance since you will have a closer look at other specimens further along.

As you proceed, a collection of *Tilia* species, lindens and basswoods, is on the right. A few of these excellent shade and street trees may still be in bloom in early July. Fragrance and nectar for bees are the main assets of their flowers.

Next, while you walk under and enjoy the architecture of the cork trees, look up the road to see the smoketrees. They are especially beautiful if seen with the morning or late afternoon light shining through their fuzzy fruiting structures. *Cotinus coggygia* is native to an area from southeastern Europe to central China. These large shrubs prefer a sunny, well-drained site and actually perform best in dry, rocky ground. In June small insignificant flowers appear. After flowering, the numerous stalks of sterile flowers elongate and become covered with fine hairs. By early July and lasting through August, the pinkish, plumose fruiting structures cover the plants, giving them their smoky look. The dark blue-green foliage is quite distinctive. Several cultivars can be seen by walking around the group. Some of these, such as 'Flame', have especially bright autumn color; others have purplish or red foliage throughout the growing season. Here you will also see some plants of the larger-leaved *Cotinus obovatus*, the only other species in the genus and native to the southeastern United States. It is now rather rare in the wild, probably because it has been cut down extensively to obtain a yellow dye from the wood. The fruiting clusters of the American Smoketree or Chittamwood are not as showy as those of the Eurasian, but in autumn this species outshines *C. coggygia* when the leaves turn a brilliant scarlet or orange.

If it is mid-July, leave the road on the right at the *Aesculus* or horsechestnut collection and walk about 20 yards to the foot of a wooded hill to see a very lovely summer blooming shrub, *A. parviflora*, the Bottlebrush Buckeye. The most familiar members of the genus *Aesculus* are trees, and all but this species bloom in late spring. With its large spikes of white flowers and dark green, palmately compound leaves, this shrub is one of the finest sights of summer in the Arboretum. There is a very cooling effect in the combination of green and white here in the shade. This species is endemic to Georgia and Alabama where it occurs in dense colonies in rich woods, shady hillsides and along stream banks. So distinct is it compared to other *Aesculus* that it is considered alone in a separate section of the genus. That means it has no very close relatives. Another distinction is that moths are most likely its principal pollinators. This particular plant, which forms a neat border to the oak woods, was added to the Arboretum collection in 1898 from the garden of Charles S. Sargent. At the end of July, as this plant has ceased flowering, *A. parviflora* var. *serotina* is in full bloom. Located to the right, further in from the road, it is a taller plant with narrower flowering spikes.



Cotinus coggygia.

Back at the road are some examples of the Goldenrain Tree, *Koeleruteria paniculata*, a medium-sized, round-headed tree species from China. The generic name honors Joseph G. Koelreuter, an 18th century German professor of natural history who is attributed with being the first to point out that insect visits are necessary for flower pollination. Wide clusters of cheerful yellow flowers appear on this plant during the first three weeks of July and are soon followed by light green bladder-like fruits which remain attractive all summer and autumn. In detail the four asymmetrically arranged petals each have a glowing orange-red spot at the base which changes color as the flowers age, probably serving as an indicator to insect visitors. *Koeleruteria* and a shrub, *Xanthoceras*, are the only members of a primarily tropical family, Sapindaceae, that can be grown in the Arboretum. Because of its ability to withstand drought and high winds, the Goldenrain Tree has been widely planted in the Midwest. Two of the varieties here may be of interest: 'September' consistently blooms two months later than the species. Originating as a seedling found growing on the campus of Indiana University, it has been in the trade only since 1967. A bit further down the road are two specimens of the very narrow-crowned variety, 'Fastigiata'.



Aesculus parviflora.

By the time the typical *Koelreuteria* is in fruit, the *Clethra alnifolia* var. *rosea* in front of it will be in bloom with upright clusters of pale pink, wonderfully fragrant flowers. This is the pink-budded form of the Summersweet, which often is found as quite a tall shrub in swamps or wet woods from Maine to Florida. When grown in drier situations, its form is dense and compact. There are a few places in Massachusetts where it occurs in colonies large enough to be of importance as a honey-plant. Few woody plants supply great quantities of nectar at this season, and so beekeepers usually must rely on a large source of flowering herbs for any late season honey production.

Above the azaleas in this border, *Oxydendrum arboreum* starts to flower as the Goldenrain Trees finish. Called Sourwood or Sorrel Tree, it is native to the eastern United States from Pennsylvania south. Both common and scientific names refer to the acid or sour taste of the leaves. Across the road beyond the Flowering Dogwood is another example of the species that you can examine more closely. The slightly drooping, lustrous leaves, curved sprays of ivory-white flowers, and narrow or pyramidal crown make this a distinctive and graceful tree. It is equally handsome in autumn when the leaves turn a rich red while remaining pale underneath, and flowers are followed by similar clusters of yellow-tan fruits. A close look at the urn-shaped flowers similar to those of *Pieris* or blueberries gives a clue that this is a member of the Heath Family, Ericaceae. *Oxydendrum* is the only tree of this family that is hardy here although the family is well represented in the Arboretum by such popular ornamental shrubs as *Rhododendron*, *Pieris*, *Vaccinium* and *Kalmia*. Sourwood has no close relatives among Ericaceae and is believed to be the survivor of a comparatively long, isolated evolutionary sequence. In the mountains of the South, Sourwoods are a very important source of nectar. The honey made from them is regarded as one of the finest flavored and commands a high price.

Also on this side of the road can be seen the last of the azaleas to bloom, *Rhododendron prunifolium*, Plumleaf Azalea. Its orange flowers appear throughout the summer. Not discovered until 1913, this species is found wild in a limited area along the Georgia-Alabama border. The Arnold Arboretum was responsible for first introducing this valuable azalea into cultivation in 1918 when it grew seed received from T. G. Harbison, a collector for the Arboretum.

Two more species of *Clethra* which may be compared with the Summersweet are across the road. This genus is another that is the only representative of its small family in the Arboretum. Taller than *C. alnifolia* and blooming a couple of weeks earlier is *Clethra acuminata*, called Cinnamon Clethra because of its smooth, rusty-brown bark. *C. barbinervis*, a native of Japan, is the tallest and earliest to bloom. It can attain the proportions of a small tree. Its flowers are larger, but only slightly fragrant, and the light tan bark is attractive. E. H. Wilson called it the handsomest of our clethras.

Your first close view of the Silk tree, *Albizia julibrissin*, is at the foot of the wooded hill that reaches the road on the right. The best example of this species will be seen at the top of Bussey Hill. The delicate, airy aspect of the twice-pinnately compound leaves and pink powder-puff inflorescences on the flat-topped crown is unique among hardy trees in the Boston area. Of the three sub-families of the great Legume Family, the Mimosoideae is a group that occurs almost exclusively in tropical regions. *Albizia julibrissin* is the only woody mimosoid legume that will grow in this climate. The "powder-puff" is actually a cluster of several flowers, each with numerous pink thread-like stamens and insignificant green petals. Many un-

opened buds and spent flowers reveal that the Silktree blooms over a period of several weeks.

If you do not have time to complete the walk, at this point you may choose either to go only as far as the shrub collection or to go directly to the top of Bussey Hill.

There are a great many things to see in the shrub collection, but we will concentrate on only a few of them. As you enter the lefthand path from the grassy area between the ponds, honeysuckles occupy the first two rows. When laden with blue or bright red or orange translucent berries, many of these plants are quite pretty. The berries are relished by birds. Mottled, lopsided, apple-like fruits on shrubs in the next rows are those of the flowering quince, *Chaenomeles* species and varieties. These are not the "true" quince but can be used for jelly and are eaten by squirrels and other animals.

More examples of *Clethra* are at the end of the fourth row. Here you can see *Clethra alnifolia* cv. 'Pink Spire' which is the best pink variety.

Nearby, not blooming until late in August, are plants of *Clerodendrum trichotomum*, Harlequin Glorybower. The fragrant white flowers with long-exserted stamens and reddish calyx give a star-studded effect. As fruits mature to a steel-blue drupe, the calyx becomes fleshy and dark red in striking contrast. *Clerodendrum* and *Vitex* are members of another predominantly tropical family, the Verbenaceae. This gives a clue as to why these shrubs die down to the ground every winter in our New England climate. This is not necessarily a disadvantage. Since *clerodendrum* produces its flowers on growth of the current year, nothing is lost, except large size, by its being killed back.

You may see a few lingering flowers on the roses, but by August the orange or red hips begin to color, prolonging the season of interest for many of the shrub or wild-type roses. Rose hips are high in vitamin C and are used in teas and preserves.

The large shrubs with plume-like panicles of white flowers or reddish immature seed capsules are species of *Sorbaria*. They are members of the large, ornamentally important Rose Family. Called false-spiraeas, sorbarias come from central and eastern Asia. The impressed veins make individual leaflets look pleated, giving a rugged texture over-all. Because of their large proportions and suckering habit, false-spiraeas need plenty of room or a heavy pruning every few years. Across the path are their close relatives, the true spiraeas. Various species and varieties of *Spiraea* come into bloom throughout the spring and summer months. Most of the commonly planted kinds are of Asian origin. You may recognize that Steeplebush or Hardhack and Meadowsweet, which bloom in fields and roadsides of New England at this time, are also species of *Spiraea*. *Spiraea* × *bumalda* 'Anthony Waterer', a hybrid of two Japanese species which originated in England in the 1890's, is one of the most popular spiraeas be-



Albizia julibrissin. Photo: P. Bruns.

cause of its long period of bloom, deep flower color and compact habit.

Good shades of blue are rare among hardy shrubs. The grey cast and lacy texture of foliage add to the garden value of the uncommon chaste-trees or *Vitex*. Of the two species here, *Vitex agnus-castus* has coarser foliage but its dense clusters of flowers are more prominent than those of *Vitex negundo*. The white-flowered *V. agnus-castus* var. *alba* is rather bland by comparison. All have a strong aroma in their foliage which you may enjoy. The epithet, *agnus-castus*, and common name refer to the ancient use of this Mediterranean native as a symbol of innocence and purity at festivals and weddings. The flexible stems of *Vitex* are still used by the Greeks in basketry. Like clerodendrum, *Vitex agnus-castus* often dies back in winter. Next to the chaste-trees, 'Hever Castle' is one of many varieties of *Buddleia davidii* which we'll see on top of Bussey Hill. This one blooms later than the chaste-trees.

Behind the vine trellis, on the rock wall, the trumpetcreepers send forth 3-inch orange or red tubular flowers from mid-July to September. The Arboretum's plants are varieties of *Campsis radicans*, na-

tive from Pennsylvania to Missouri and south where it can become so rampant that it is considered a pest. *C. × tagliabuana* 'Madame Galen' is a handsome hybrid between *C. radicans* and a tenderer oriental species, *C. grandiflora*. Climbing by root-like holdfasts, trumpetcreepers may grow to 30 or 40 feet.

As you start back through the shrub collection on the other path, you may notice some low shrubs with arching branches full of pink flowers and spongy white berries resembling popcorn. Several species of *Symphoricarpos*, snowberries, grow here. All do well in any soil and retain their decorative fruits well into the winter. In the western United States where several species occur, their fruits are an important wildlife food. They may be toxic to humans, however.

Potentilla fruticosa, another member of the Rose Family, is one of a very few woody plants native to both northern hemispheres. It has an unusually wide, though discontinuous, natural distribution in mountainous regions and northern latitudes. Varieties of *Potentilla* are good subjects for the small garden since they seldom reach 4 feet in height. They have no serious insect or disease problems and will grow in a wide range of soils. As you can observe, there are many cultivars varying in flower color, length and time of bloom, and compactness of habit.

Among the potentillas and elsewhere in the shrub collection and on Bussey Hill are examples of the genus *Hypericum*, the St. Johnsworts. This large genus is represented here by several hardy, low shrubs with bright yellow flowers. There is an interesting explanation for their curious common name. With their sunny coloring, numerous radiating stamens, season of bloom and supposed curative properties, hypericums were most likely associated with celebrations of the summer solstice in ancient times. When the Christian Church took over these rites and converted them to honor St. John, the plants were renamed as well. The characteristic feature of *Hypericum* flowers is the numerous stamens which are sometimes grouped in three or five bundles depending on the species. *H. frondosum*, from the southern United States, is one of the best with its 2-inch orange-yellow flowers and bluish foliage. On older plants the red-brown bark exfoliates. Selected for its especially large flowers with striking orange anthers on relatively short filaments, *Hypericum* cv. 'Sun Gold' is a hybrid involving *H. patulum*, a widely cultivated species from China. The hypericums are recommended for their ability to grow on poor soils.

Of all the summer blooming shrubs, the hydrangeas are perhaps the most familiar. The flower clusters are flat, rounded, or pyramidal, often with fertile flowers in the center surrounded by showy neuter flowers which have only large petal-like sepals. Many garden forms have been selected for their more numerous neuter flowers. The "snowball" types completely lack reproductive flowers. Some of these were long cultivated in Japanese gardens before being introduced into this country.

Four of the species here bloom from late June into July. Variety 'Grandiflora' of the American species *arborescens*, the so-called Hills-of-snow, is one that develops only neuter flowers. Its flower heads are often so large that stems droop with their weight. *H. cinerea* is similar to, and often considered a subspecies of, *H. arborescens*. It is mainly represented in cultivation by cv. 'Sterilis'. *H. heteromalla* from the Himalayas has a similar inflorescence type but is a taller plant. The hydrangeas commonly sold by florists at Easter time are forms of *Hydrangea macrophylla*; here you can see a few of the hardiest forms. *H. macrophylla* is more commonly grown further south, especially along the seacoast, where its flower color is blue on acid soils and pink on alkaline.

The pyramidal panicles of *H. quercifolia*, Oakleaf Hydrangea, start to open in mid-July. Its bold, distinctive foliage which takes on russet tints in autumn, and its ability to thrive in shaded locations make this a valuable garden plant although it is less hardy than the other species.

The last to bloom is *Hydrangea paniculata* from Japan and China. Two varieties can be seen here: 'Praecox' which blooms three weeks earlier than the type, and 'Grandiflora' with all-neuter flowers in the cluster.



At the edge of the pond the shrub with neat spherical flower clusters is the Buttonbush, *Cephalanthus occidentalis*. It grows wild in similar situations throughout eastern America and is the only hardy woody member of the mainly tropical Madder Family, Rubiaceae.

Look across toward the other pond to see the dramatic effect of the 2- to 3-foot wide plumes of creamy-white flowers on the Japanese *Aralia elata*. Upright, scarcely branching stems and large horizontally oriented compound leaves forming a flat-topped crown add to the exotic look of this plant. Because of their threatening thorns and tendency to form dense thickets, this and its close American relative, *A. spinosa*, are both called Devil's Walking Stick.

In the Tree Legume area two genera exhibit summer bloom. The dense racemes of dull white flowers of *Maackia* species are not particularly showy but the shiny greenish bark with diamond-shaped lenticels is attractive.

The second Legume, *Sophora japonica*, Pagoda- or Scholar-tree, is one of the outstanding summer blooming trees. Its creamy-white flowers in loose panicles appear through the month of August, and a light shade is cast by its fine foliage. Leaflets are dark green above and a contrasting grey-green beneath. The Scholar-tree has been cultivated on temple grounds in Japan for at least a thousand years but is actually native to China and Korea. Chinese tradition dictates *Sophora japonica* as the memorial tree at the graves of scholars. A yellow dye can be obtained from the dried flowers and has been used medicinally in China. This tree is easy to grow and very tolerant of city conditions.

About midway up Bussey Hill, a planting of Rose of Sharon or Shrub Althea is the next flowering group to see. Linnaeus named the species *Hibiscus syriacus*, believing it to come from Syria. As with many plants that have been long cultivated by man, its nativity is uncertain but is now thought to be northern India and China. With either single or double flowers in shades of pink, purple or white, about twenty of the many cultivars are growing here and on the far side of the hill.

Most of the summit area of Bussey Hill was replanted in 1972, except, of course, the grove of White Pines and the large Silktree and other older specimens. This is our finest plant of *Albizia julibrissin*. (See the Twenty Favorites Walk for more on this.) Around the circle of fence are several shrubs of interest.

In August and September, *Elsholtzia stauntoni* bears its spikes of reddish-purple flowers profusely. This species was introduced into cultivation by the Arnold Arboretum in 1905 when John G. Jack obtained cuttings from plants he found in the hills near the Great Wall in China. Details such as the opposite arrangement and aromatic leaves, square stems and two-lipped flower form indicate that this is a member of the Mint Family.

Blooming earlier is a group of *Hypericum prolificum*. Compared with the species we saw in the shrub collection, this one has smaller flowers but they are abundantly produced. It is one of the hardiest of the St. Johnsworts.

You may see butterflies, or in the evening, moths fluttering around the nearby group of *Buddleia davidii* cultivars. They are called butterflybush and do attract these insects in numbers. This planting demonstrates some of the variability of flower color, time of bloom, and size of inflorescence of this species. The French missionary and plant explorer Abbé Armand David, who first discovered it wild in western China in 1869, is honored by the specific name. The shrubs are rather coarse-leaved, ungainly and large, but their fragrance and butterfly-attracting qualities make them welcome in any garden with sufficient space. These and the elsholtzias share the habit of dying back in winter here, but both grow up to bloom every year. The brown fruiting spikes of buddleias are good subjects for winter bouquets.

In front of the view of the Blue Hills are some striking plants, superficially resembling the Chaste-trees but smaller. Russian Sage, *Perovskia atriplicifolia*, is the only other woody member of the predominantly herbaceous Mint Family in the Arboretum. Its silvery white stems and leaves have a strange pungence and contrast visually with the violet-blue flowers. It is found wild from Afghanistan to western Tibet where it sometimes covers large areas to the exclusion of other vegetation. It does not appear to be that vigorous here but is said to thrive in hot situations.

We have seen the majority of the plants in bloom at this time in the Arboretum, giving good examples of the diversity and qualities of summer bloomers. From here you can use the map to see more or choose a different route to return.



Austrobaileya

by RICHARD E. WEAVER, JR.

One of the plants unfamiliar to most Arnold Arboretum visitors is a rather nondescript vine with opposite leaves that is growing in the conservatory section of the Dana Greenhouses. The plant has been scrambling around the conservatory for about twelve years now, but has never shown any signs of flowering until three buds were noticed a few weeks ago by the greenhouse staff. One flower opened on March 29, the first time, to our knowledge, that a plant of this species, genus, or even family has ever bloomed in cultivation. The plant is a species of *Austrobaileya*, native to the tropical forests of North Queensland, Australia. The flowers are not particularly attractive, and they have a strong, unpleasant odor, but their structure places *Austrobaileya* among the flora that theoretically most closely resemble the first flowering plants on the earth.

As shown in the accompanying photograph, probably the first ever published of a living *Austrobaileya* flower, the perianth is not differentiated into petals and sepals, but rather consists of a series of spirally arranged tepals of greatly varying size. The stamens consist of a broad, almost leaf-like structure with the anther sacs attached to the upper surface. These all are considered to be primitive characteristics, and there are numerous others that do not show in the photograph.

Ever since *Austrobaileya* was described in 1933, botanists have been puzzled as to where it should be classified. It now is usually placed in a family of its own. The name commemorates two men, F. M. Bailey, a noted Queensland botanist, and I. W. Bailey, long-time Arnold Arboretum staff member and world-renowned wood anatomist who was particularly interested in primitive flowering plants and who published a detailed account of the anatomy and morphology of *Austrobaileya*.

The Arnold Arboretum's plant was grown from seed collected by a Mr. Webb and a Mr. Tracey near Ravenshoe, North Queensland. The seeds were sent to Mr. Peter Green, then on the staff here, and were sown in 1964. The lot consisted of four seeds, and only one germinated about a year later. In the absence of flowers, the plant was tentatively identified as *Austrobaileya scandens*, the only other

species described being *A. maculata*, and it was widely distributed under the former name. Now, even with flowers, we are not able to identify the plant with certainty. It has fewer tepals than either of the described species, and the flowers are not solitary; the stamens combine characters of both species. We are reluctant to describe it as a new species because of the very few, miserably preserved herbarium specimens on hand with which we can compare it.

The Arnold Arboretum has a long association with *Austrobaileya*. The genus and both species were described in Contributions from the Arnold Arboretum and the Journal of the Arnold Arboretum. Accounts of its chromosomes, anatomy and morphology were published in the latter journal. It is fitting that our plant, the parent of most all other plants in cultivation, should be the first to flower. The botanists of North Queensland also have an attachment to the plant, since it commemorates one of the most famous of them, since it is restricted to the region, and since it has caused such a stir in the botanical world; consequently, the new publication from the Queensland Herbarium has been named *Austrobaileya*.



The flower of Austrobaileya sp., slightly larger than life size, photographed in the Dana Greenhouses of the Arnold Arboretum. The fleshy tepals are greenish-white with purple spots. The heavily spotted structures in the center of the flower are staminodes, or sterile stamens. Photo: R. Weaver.

ARNOLDIA REVIEWS

The Terrace Gardener's Handbook. Linda Yang. New York: Doubleday and Co. 283 pages, illustrated. \$8.95.

Gardening Off the Ground. Art C. Drysdale. Canada: J. M. Dent and Sons Ltd., 125 pages, illustrated. Paperback. \$3.95.

Both of these books are written for the increasing numbers of individuals who would like to garden but are limited to the small spaces afforded by balconies, terraces or rooftops.

Linda Yang offers her personal experiences as a professional architect and an avid terrace gardener in New York City to discuss basic plant requirements and garden design. More important, however, are her observations on situations unique to terrace or rooftop gardening; things such as support strength of balconies and roofs, problems with high winds and falling objects, winter protection, and suitable plant material and containers. The use of woody ornamental trees and shrubs is recommended to provide year-round interest and form in these types of gardens.

Gardening Off the Ground gives similar but less detailed advice and cautions, and places more emphasis on flowering annuals and vegetables. The author writes from experience with plant material in Toronto, Canada which should be a source of encouragement to those inhabitants of the northern U.S. who are doubtful about the success of growing woody plant material outdoors in containers.

JAMES A. BURROWS

Flora of Okinawa and the Southern Ryukyu Islands. Egbert H. Walker. Washington, D.C.: Smithsonian Institution Press. 1159 pages, 209 black and white illustrations. \$36.75.

Okinawa and the Ryukyu Islands are familiar to those who lived during World War II as the islands to the south of the archipelago of Japan. Egbert Walker is the author with the late Dr. E. D. Merrill of the Bibliography of Eastern Asiatic Botany and sole author of the supplement. The present massive volume of 1159 pages (8" \times 10 3/4") is the result of eleven years of work converting a check list to an excellent flora. It is not a tourist volume but rather a major contribution to the taxonomists and plant geographers studying the flora of Asia. The inclusion of cultivated plants, the indication of introduced weeds, the detailed synonymy with complete references and the high quality of the descriptions and the keys make this a volume certain to become a classic in its field.

RICHARD A. HOWARD



*ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Massachusetts, U.S.A.*



ARNOLDIA

The Arnold Arboretum Vol. 38, No. 4 July/August 1978

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ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Mass. 02130

Published six times a year: in January,
March, May, July, September, and November.
Subscriptions \$8.00 per year. Single copies \$2.00.
Second Class postage paid at Boston, Mass. Copyright © 1978 by the
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Cover: *Styrax japonica*. Specimen grown from seed collected by C. S. Sargent in
Japan, 1892. Photograph: Chvany.

The Ornamental Birches

by RICHARD E. WEAVER, JR.

The genus *Betula*, the birches, includes perhaps forty to fifty species restricted to the cooler regions of the northern hemisphere. The species vary greatly in their habit, from low alpine shrubs to tall forest trees. The latter species are those most commonly cultivated as ornamentals, and they will be the subject of this article.

Here in New England, birches are familiar native trees. While four species are common, the Canoe Birch, *Betula papyrifera*, with its striking white bark, is the most conspicuous one in the landscape. This species and its closest Eurasian relatives are also the most common in the urban and suburban landscape because of the unique and striking color of their bark. Unfortunately these species are susceptible to several devastating insect pests. Other species of equal ornamental value are available to replace them but are practically unknown to gardeners. One purpose of this article is to give exposure to some of these alternative trees.

The collection of birches here at the Arnold Arboretum has deteriorated for one reason or another over the years. Many of Ernest Wilson's Asiatic introductions did not prove reliably hardy and have long since disappeared. And the location of the collection itself — a dry, gravelly hillside — is not ideal for plants that prefer a cool, moist soil. As a result, many of the trees lack a certain vigor, rendering them susceptible to the ravages of the Bronze Birch Borer. Yet, the collection contains about forty-five species, varieties, hybrids and cultivars, and some exceptionally fine specimen plants. Most of the personal observations recorded in this article were based on the Arnold Arboretum's collection and I wish to thank Mr. Kenneth Shaw, Assistant Supervisor of the Living Collections, for his tutoring on the insect pests and their control, as well as Mr. Henry Goodell, Assistant Superintendent, and Mr. James Nickerson, Arboretum pruner, for measuring the trees.

The classification of the genus is somewhat confused, and many of the species are difficult to distinguish without the use of technical characters. All, however, have simple, alternate leaves with toothed edges, shape varying from triangular to elliptic at least in the arborescent species, which usually color yellow in the fall. The bark is marked with conspicuous horizontal lines — breathing pores or lenticels — and these are persistent even on the old trunks of most species. The flowers are unisexual, borne in separate "male" and



Leaves and fruiting catkins of representative Betula species. Clockwise from top right, Betula pendula, B. pendula 'Gracilis', B. albo-sinensis, B. populifolia, B. lenta, B. alleganiensis, B. ermanii, B. schmidtii, B. papyrifera.

Photograph: R. Weaver.

"female" catkins on the same tree. The males of most species are formed in the fall, but they elongate and open, exposing the copious wind-borne pollen as the leaves are unfolding in the spring. The females are formed in the spring; after they are pollinated they expand and become quite stout. As is obvious when they mature and fall apart in the late summer, they are composed of numerous three-pronged scales each with three seeds, the latter actually tiny flattened nutlets with a thin, membranous wing on each side that allows them to be dispersed by the wind.

NOTES ON GENERAL CULTURE

Birches are fast growing, and many are short-lived. Although there are several exceptions, most do best in a cool, relatively moist situation. At least the white-barked species are weak-wooded, and their twiggry crowns collect and hold ice and snow. Therefore they are subject to damage from winter storms. Because of these characteristics, few birches would be recommended as street trees. For

home plantings, they are probably most useful when placed in groves with other trees, although a few are most effective when planted as specimens. Care should be taken to prevent the outer bark of the white-barked species from being stripped or marred since the injured area will always remain black.

INSECT PESTS

Birches are susceptible to attack from several insects, but only the two discussed below are generally serious.

Birch Leaf Miner (*Fenusa pusilla*). This small black sawfly is native to the Old World. Entomologists first reported it in Connecticut in 1925, but it has spread rapidly and is now common throughout New England and the Mid-Atlantic states. The adults overwinter in the soil in the pupal stage. They emerge and lay their first batch of eggs directly on the birch leaves sometime during May, with later batches in July and August. If the leaves are young and tender enough, white, maggot-like larvae, upon hatching, burrow into the leaf tissue and eat their way through it. The infested areas first



Leaf miner damage in *Betula populifolia*. Above, early damage, the eggs just hatching on right; below, full extent of damage. Photograph: R. Weaver.

appear papery and finally brown. The effects are at least unsightly, but repeated, severe attacks cause the trees to decline and make them susceptible to other pests, particularly the Bronze Birch Borer.

In general only the species in the *Betula papyrifera* — *pendula* — *populifolia* alliance are highly susceptible to the leaf miner, although other species may show some damage from the spring brood. The later broods, incidentally, are seldom serious since only leaves on sucker shoots are generally tender enough to be damaged. The leaf miner can be kept under control by spraying with Malathion early in May, with two subsequent sprayings at ten-day intervals. To control the second brood, the trees should be sprayed around the first and tenth of July.

Bronze Birch Borer (*Agrilus anxius*). This is a native beetle widely distributed in the northern United States and southern Canada. Although it occurs in natural stands of birches, it is usually only devastating to those trees planted as ornamentals. Again, the white-barked species related to *Betula papyrifera* and *B. pendula* are most susceptible.

Adult beetles emerge and are active for a long period during the summer. They lay their eggs in cracks in the bark, particularly in new wounds. Upon hatching the white, grub-like larvae tunnel into the cambium which they feed upon one to two years, and in the process make long, winding channels between the bark and the wood. If a limb is girdled, it of course dies. The first obvious signs of damage are sparse and chlorotic foliage, particularly high in the crown of the tree. By this time, unfortunately, there is little to do except to remove the infested branches if possible and preferably burn them.

Like many other insect pests, the Bronze Birch Borer is only seriously damaging to the trees that already have been weakened by disease, other insects, or unfavorable growing conditions. Healthy trees can usually recover from attack, with no outward damage except for lumpy areas on the bark where the borers were active.

The susceptible white-bark birches are plants of northern latitudes and high elevations — areas with cool, moist summers and a good snow cover in the winter. The warmer and drier the site in which they are grown as ornamentals, the less vigorous in general they will be. For this reason these trees are not satisfactory in the southern United States. In other areas, regular watering and annual fertilization will help maintain vigor, as will a heavy mulch to retain moisture during the growing season and to protect the roots in the absence of a snow cover during the winter. Spraying the trunk and major branches with Lindane, where this is permissible, will give some measure of control as well. A recommended schedule would be to apply the spray late in May, with two subsequent applications at two-week intervals.

PROPAGATION

Fresh seeds from birch species germinate readily without pretreatment; older seeds germinate more uniformly if stratified for three months at 40°F. However, because most species hybridize readily, seed is a satisfactory means of propagation only if it is collected from wild sources or isolated cultivated specimens. Unfortunately many birches root poorly from cuttings, although here at the Arnold Arboretum we have succeeded with softwood cuttings of the hybrid *Betula* × *jackii*, *B. davurica*, and *B. maximowicziana*. Best results were obtained with 1% IBA or a mixture of .8% IBA and 15% Thiram. Most species are propagated commercially by grafting, basically any species serving well as understock for any other.

SELECTED SPECIES

The species discussed below are grouped according to their natural relationships since closely related species have more or less the same horticultural attributes.

Birches With White Bark

Betula papyrifera

Canoe, Paper, or White Birch

This is the most widespread of the American birches, its distribution stretching almost across the continent in the north. It is basically a plant of the cool north woods, and it grows almost to the Arctic treeline in eastern Canada. Although its wood is not as valuable as that of the Sweet or the Yellow Birch, various parts of the tree were put to good use by the Indians and the early European settlers and explorers. Now it is widely grown as an ornamental, its white bark comparing favorably with that of the European White Birch, although neither its crown nor its foliage is as graceful as in its European relative. Over its wide geographic range the Canoe Birch is extremely variable, and its bark is not always white. The types that range through New England and around the Great Lakes make the best ornamentals.

At least in the Northeast, this species reputedly suffers less from the Bronze Birch Borer than other commonly grown white-barked species. However, many of the specimens at the Arnold Arboretum have shown slight to heavy borer infestations, and recently several have been removed. Our finest specimen is growing in the yard at 163 Walter Street on Peter's Hill. We do not have any records for this plant; it is somewhat atypical for the species and perhaps represents a hybrid with the Canoe Birch as one parent. To me it is one of the most beautiful trees in the Arnold Arboretum. It is 60 feet tall with a spread of 68 feet — the largest birch in our collections. It is completely free from borers. We hope to propagate the tree and further test it for borer resistance.



Betula pendula 'Youngii'. Photograph: D. Wyman.

Betula pendula (formerly *B. alba* or *B. verrucosa*)

European White or Silver Birch

This native of northern Europe, with its glistening white bark and gracefully drooping branchlets, is one of the most striking and beautiful of hardy shade trees. It is unfortunately among the shortest-lived, weakest-wooded, and most susceptible to leaf miner and borer of all the birches. With proper care it can be a satisfactory plant, and the elegance of a mature specimen, particularly of one of the selected clones, is certainly worth a lot of trouble. The following clones, many of which are considerably more attractive than the species, are available in the American nursery trade.

'Fastigiata' — Columnar European Birch. An upright form, densely branched from the base, this can be a beautiful tree. The slender twigs impart a feathery appearance to the plant, particularly in the

winter. Unfortunately it is extremely prone to damage from snow and ice. Even if the branches do not snap, those that are bent seldom return to their former upright position, and the trees eventually come to look a bit monstrous. The winter of 1976–1977 was a particularly bad one for the specimens of this clone in the Arnold Arboretum's collection, and nearly all of them were ruined.

'Gracilis' — Cutleaf European Birch. Often referred to in nursery catalogues as 'Laciniata', this is the most commonly grown of several clones with finely cut leaves and long, wispy, pendulous branches. It is perhaps the most graceful of the European White Birches, but it is unfortunately prone to the problems common to the rest.

'Tristis' — Slender European Birch. This is similar to 'Gracilis' in its long, drooping branches, but the leaves are not finely cut, and the crown is usually very slender and graceful.

'Youngii'. This clone is characterized by small size, stiffly drooping branches, and rather irregular growth without a central leader. It is best grafted onto a high standard.



Betula populifolia

Gray Birch

This small tree is common throughout southern Canada and the adjacent United States south to Ohio and Virginia. It is a somewhat weedy tree, one of the first to appear in pastures, along roadsides, or other disturbed areas. Unlike our other native arborescent birches, it would never be a component of a mature forest.

Like most weedy trees, the Gray Birch is quick-growing and short-lived, and it grows well on poor, dry soil. Its ornamental uses are not quite comparable to those of other white-barked birches but it does have its place in the cultivated landscape. The bark is slightly grayish with conspicuous dark lenticels and rather numerous black areas — all in all not nearly so distinguished as the bark of the Canoe Birch or the European White Birch. And even under the best conditions, the trees develop a slender twiggy crown — graceful but a bit skimpy. Because of this habit of growth, however, they are excellent for planting in clumps. The species is poorly represented in the collections of the Arnold Arboretum, but one twenty-seven-year-old specimen is 32 feet tall, with a spread of 16 feet.

The Gray Birch is susceptible to the Bronze Birch Borer and highly susceptible to the Birch Leaf Miner, so much so that the foliage of unsprayed trees is often quite brown and unsightly by midsummer. Its twiggy crown collects snow and ice to a greater extent than that of most other deciduous trees, and it is common in New England to see large patches of these trees bent nearly to the ground after a winter storm. They are amazingly pliable, however, and healthy trees will usually return to their more or less upright stature.

Birches With Whitish to Reddish Bark***Betula ermanii***

This species, in its finer forms, is probably the best white-barked birch theoretically resistant to the Bronze Birch Borer. It is common throughout much of temperate eastern Asia, often at high elevations. In Japan at least, it ascends to the treeline. The plants from high elevations are shrubby in nature, and probably would remain so in cultivation. Those from lower elevations are graceful trees, often with several trunks. The color of the bark varies greatly, from silvery gray-brown to white, so for ornamental purposes seed-grown material should be avoided in favor of clonally propagated plants. The oldest specimen presently among the Arnold Arboretum's collections has many desirable ornamental qualities. At twenty-five years it is 25 feet tall with a spread of 28 feet. Its trunk divides into three near the ground. The bark is lustrous white with a creamy to pinkish tinge, and long, narrow, pale-colored lenticels. It is mostly tight on the trunk, looking almost stretched, although there are areas where it shreds off in thin strips. Very few large, black areas are evident. The tree is completely free from the borer.



Winter aspect of various birch species. Left, part of the birch collection at the Arnold Arboretum showing *Betula ermanii* in the center, *B. populifolia* just to its left, and several specimens of *B. papyrifera*; right, a specimen of *B. pendula* 'Fastigiata' showing the bent branches caused by snow and ice.

Photographs: R. Weaver.

Although the Arnold Arboretum introduced this species into cultivation in the United States in 1881, it is still rare in this country and it has never been pushed as a nursery item. Perhaps its main drawback is that the white color of the bark does not develop as early as in some other species, but its resistance to the ravages of the Bronze Birch Borer should be ample compensation.

Betula albo-sinensis

Chinese Paper Birch

This native of western China was introduced by Wilson when he was collecting for Veitch, but it is rare in cultivation at present. I have never seen a truly good specimen, but from descriptions this must be a beautiful tree. Typically, the peeling, orange-brown bark is reminiscent of that of the celebrated Paperbark Maple (*Acer griseum*), although it does vary in color to orange-gray or nearly white.

The two specimens at the Arnold Arboretum are very different in appearance. They are about the same age (twenty-five years), but



one is low, sparse and generally undistinguished although the bark is an attractive yellowish-white peeling to reveal an orange-brown layer. The other has a tall slender crown, 39 feet tall by 29 feet wide, and is a lovely tree. The bark is basically a lustrous white, peeling to buffy orange-brown. This species is not closely related to the Canoe or European White Birch, and should be borer-resistant. However, the finest of our two specimens has recently shown serious borer damage.

Birches With Dark Bark

Betula lenta

Sweet, Black, or Cherry Birch

This species is an important component of rich deciduous forests in the eastern mountains from southern Maine to northern Georgia. It is a favorite and familiar native tree, and the three common names have almost equal popular usage. "Cherry" Birch refers to the general resemblance of this tree to various species of cherries, particularly with regard to the foliage and the mahogany to almost black bark with conspicuous lenticels; "Black" Birch recalls the color of the bark on mature trunks; and "Sweet" Birch is probably the commonest name among rural children, who delight in chewing the bark of the twigs for its sweet wintergreen taste.

To me it is a great mystery why this tree is not more commonly cultivated, because as a shade tree it is certainly as ornamental as most lindens or ashes or many maples. The male catkins, though not spectacular, are attractive in the spring, the smooth, lustrous bark of the branches is always ornamental, and the golden autumn coloration is magnificent. Add the aromatic and tasty twigs, the sturdy wood that holds up well in storms, and the lack of messy fruits, and all characteristics combine to make a very fine tree.

Although forest specimens are often tall and slender, grown in the open this species usually forms a broad, rather low arching crown. As a point of reference, a year-old specimen at the Arnold Arboretum is 47 feet tall with a spread of 61 feet.

A very close relative, *Betula grossa*, the Japanese Cherry Birch, is rare even in botanical gardens. It was introduced into cultivation by Professor Sargent in 1892, and an original plant from this introduction still survives in our collections. It is only 30 feet tall with a spread of 38 feet. It is almost equivalent horticulturally to *B. lenta* except that it is slower growing with a much lower ultimate height.

Betula alleghaniensis (formerly *B. lutea*)

Yellow Birch

Similar and closely related to the Sweet Birch, this species is common in mixed hardwood-coniferous forests of the Northeast, the Great Lakes states, and the Appalachians, occupying higher elevations the further south it ranges. It is one of the most important timber trees of the eastern forests, and the wood is a favorite for furniture and cabinetry.

The bark is a lustrous yellow-gray, peeling and curling in thin strips. On mature trunks it is darker and thicker, with a tendency in some individuals at least to become furrowed. Horticulturally this species is nearly equivalent to the Sweet Birch. Its bark, however, is paler and shreddy, and the twigs have at most a very slight winter-green taste. At the Arnold Arboretum we have a fine grove of six seventy-eight-year-old trees. The largest is 55 feet tall with a spread of 47 feet.

Betula schmidtii.

Native to Japan, Korea, and Manchuria, but rare in the wild at least in the first two areas, this exceptionally fine plant unfortunately will never be able to compete in popularity with its spectacular white-barked relatives. Yet, hopefully it will be able to rise above the complete obscurity with which it is saddled at present because it is one of the most graceful of medium-sized trees. The finest specimen at the Arnold Arboretum, representing the original introduction of the species into the United States in 1896, is planted near the top of Bussey Hill. It is 40 feet tall with a spread of 36 feet, the thirteen gracefully arching trunks forming a broad, almost hemispherical crown. The bark is steely-gray, but cracking and peeling off in stiff plates to reveal an almost black layer embossed with peculiar, circular, resinous lines. The bark is particularly striking when wet. Sharing a characteristic of its close relative, our native Sweet Birch (*Betula lenta*), the foliage turns a brilliant golden yellow in the fall. It is one of the best of our trees for this particular foliage color. Dr. Stephen Spongberg, my colleague here at the Arnold Arboretum, and I observed this species in its native habitat in the mountains of north central Korea. It was a rare component of a beautiful, rich, nearly virgin forest. One specimen was about the finest wild tree we saw in Korea.

Betula nigra

River Birch

Although the color of its autumn foliage is a bit dull in comparison to most of its relatives, this is the most striking of the dark-barked birches in many respects. The bark is unique. On young trunks and branches it is pale brown, exfoliating in thin flakes. On mature trunks it is very dark, and the flakes are large, thick, and irregular. The effect looking into the leafless crown is one of winter's finer pictures — the almost but not quite unkempt bark of the trunks passing into the paler and softer bark of the branches and, finally, the very numerous fine twigs forming a delicate tracery against the sky. The irregularly rounded, somewhat drooping crown, and the fine, gray-backed foliage are distinguished in the summertime as well.

The Arnold Arboretum's collection features a fine group of these trees on either side of the main road just before the drive up Bussey Hill. The trees are one hundred years old and the largest is 56 feet tall with a spread of 57 feet and a DBH of 3 feet.



*Birch trunks. Left, the main trunk of *Betula albo-sinensis*, showing the whitish exfoliating bark; right, looking from the main trunk into the crown of *B. nigra*. Photographs: R. Weaver.*

In the wild a tree of lowlands, flood plains and streamsides, this species ranges into eastern Texas, further south than any other native birch. It grows best in moist soils, but it will succeed in drier situations as evidenced by the fine trees at the Arnold Arboretum described above.

Betula davurica

This native of Manchuria, northern China, Korea and Japan is somewhat reminiscent of our native River Birch, particularly when young, but in our climate does not grow nearly so tall. The oldest specimen at the Arnold Arboretum (sixty-eight years old) is 35 feet tall with a spread of 40 feet. The bark of this particular tree is exceptionally handsome; on the main trunk a patchwork of ashy gray flakes in thick spongy masses interspersed with buffy brown areas of lower relief. The bark on the branches looks like a thick mat of corn flakes, varying in color from a lustrous pearly buff to cinnamon. The habit of the tree is unexceptional, the crown being low and irregularly rounded. It is, however, decidedly ornamental in the winter, and it does better on poor dry soils than most other birches. It is resistant to the Bronze Birch Borer.



Winter aspect. Above, *Betula davurica*: below *B. schmidtii*, showing the dark bark and the multiple trunks. Photograph: R. Weaver.

Other Birches

Betula maximowicziana

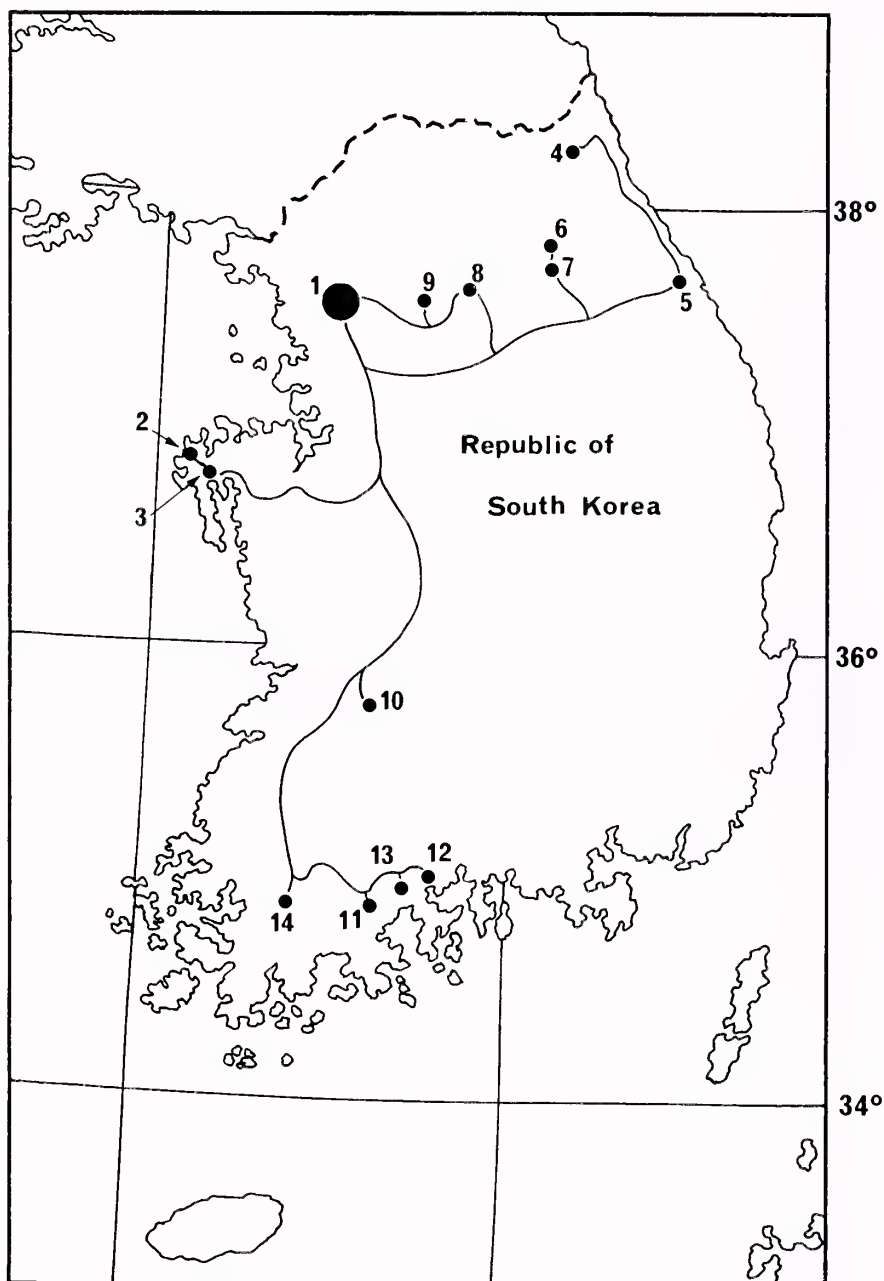
Monarch Birch

This rather atypical birch looks like a cross between a linden and an aspen. With its large, yellowish-green heart-shaped leaves, and its female catkins borne in clusters rather than singly, it is one of the most distinctive and easily recognizable of the arborescent birches. Yet most of the trees grown under this name in the United States have turned out to be something very different. This became apparent during a study by Drs. Santamour and Meyer of the United States National Arboretum, prompted by widespread publicity touting the Monarch Birch as a white-barked species resistant to the Bronze Birch Borer. This species is probably resistant to the borer, but it does not have white bark. The birches that received the publicity are not *Betula maximowicziana*, although they may be hybrids with this species as one of the parents.

The Monarch Birch was introduced into cultivation from its native Japan by Charles Sprague Sargent in 1892, but at present there are no mature specimens in the collections of the Arnold Arboretum. The species was observed several times during our expedition to Japan and Korea in the fall of 1977. The color of the bark is variable in the wild, but it is usually a lustrous orange-gray. One particularly good group cultivated at the Tokyo University Forest in Hokkaido, near the town of Yamabe, did have bark that approached white, and trees such as these may have considerable potential in a breeding program to develop a truly white-barked, borer-resistant birch.

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Sketch-map of routes and principal localities visited in Korea. Localities are numbered in the approximate order in which they were visited. 1, Seoul; 2, Chollipo; 3, Tae'an; 4, Sorak-san National Park; 5, Kangnung; 6, Changch'on; 7, Kyebang-san, Undugol Pass; 8, Hongcheon; 9, Yongmun-san; 10, Forest Research Station, Chonju; 11, Sonam Temple, Chogy'e-san; 12, Kwangyang; 13, Suncheon; 14, Mudung-san near Kwangju.

Korean Adventure

by STEPHEN A. SPONGBERG

Author's Note: This article chronicles some of the Korean portion of the Arnold Arboretum's collecting trip to Japan and Korea in the fall of 1977. The goals of this trip have been outlined in *Arnoldia* 38: 28-31. 1978, while Richard Weaver's *Japanese Journal* appeared in *Arnoldia* 38: 82-101. 1978, and described many of the events and plants encountered in Japan. As in that article, space here allows for the description of only the most memorable days and events. A detailed itinerary, however, with a list of the plants collected appears at the conclusion of this article.

I should like to express my deep thanks to Dick Weaver and my wife, Happy, for help in remembering all the details of our trip during the preparation of this article, and my warmest and deepest thanks are extended to Carl Ferris Miller, whose most generous help and hospitality made our trip in Korea possible.

On the afternoon of September 30, after having spent the morning on an excursion to the island of Miyajima in the Inland Sea (where we explored the beautiful temple there, famous for its offshore *tori* or gate), Dick Weaver, my wife, Happy, and I tried to express our deep thanks to my old graduate school friend, Katsuhiko Kondo, for his generosity and overwhelming hospitality during our travels in Japan. Back in Hiroshima, we left Katsu on the platform and boarded a Shinkan-sen or bullet train destined for the city of Fukuoka on Kyushu, the southernmost of the four major Japanese islands, where we were to spend our last night in Japan. Our trip from Hiroshima was comfortable and pleasant as we felt well accustomed to the extraordinarily efficient Japanese train service, and as darkness fell, we saw extensive plantations of tea from the train windows and were aware that we were traveling into an even more tropical climate and vegetation than we had left in Hiroshima.

Early on the morning of October 1 we taxied to the Fukuoka International Airport for our China Airlines flight to Seoul and the beginning of our Korean adventure. While we were not anxious to leave Japan, feeling as we did that we had only begun to sample its extremely rich flora, we were nonetheless expectant and excited to be headed for the Asiatic mainland. We also were particularly anxious to be able to make comparisons between the Japanese and Korean floras and to learn more of the plants of the Korean peninsula.

We arrived in Seoul in the middle of the afternoon after an easy but crowded flight, and as our plane made its descent on its approach to Seoul, I was immediately surprised by the dry and dusty aspect of the landscape, a decided change from the verdant green

and humid countryside we had left in Kyushu. After a long, hot wait standing in line, we finally cleared through customs and were able to pass into the terminal waiting room where we immediately spotted and were spotted by our host in Korea, Carl Ferris Miller.

Through our mutual friends, Admiral and Mrs. Harry Hull, we had briefly met Carl at the Arnold Arboretum almost a year before. On that visit Carl's great enthusiasm for, and knowledge of plants, particularly woody plants, had been obvious, and he had described his plans for the arboretum he is developing in Korea while convincing us that the native Korean flora, which includes many species of horticultural value, has been largely ignored by western botanists and horticulturists. Unlike the flora of Japan, which has been under scrutiny and investigation by western as well as Japanese botanists since the time of Linnaeus, the first collections of Korean plants were made as late as 1854 when Admiral B. A. Schlippenbach of the German ship "Pallada" sent a party ashore to collect specimens during his survey of the eastern coast of Korea. One of their discoveries was the beautiful pink-flowered azalea, *Rhododendron schlippenbachii*, named to honor the Admiral by the botanist Maximowicz.

Our decision to include Korea on our itinerary was largely due to Carl's convincing arguments, our desire to see Carl's Chollipo Arboretum, and the fact that the climate of Korea is more similar to that



of New England than is that of Japan. With hot summers and very cold winters, plants growing in Korea are adapted to a continental climate, and we were anxious to collect seeds of species hardy in Korea for trial at the Arnold Arboretum.

After spending a relaxing hour or two at Carl's Seoul townhouse discussing plans for the upcoming two weeks, sipping iced tea, and then quickly rearranging our luggage, we left Seoul with Carl and Chin-su, one of Carl's adopted Korean sons and also an avid plantsman. In Carl's version of a Ford Pinto station wagon, we drove south and then, after exiting from the Seoul-Pasan Expressway, proceeded in a westerly direction. Our destination was Chollipo, as the crow flies about seventy miles southwest of the capitol city, and during the trip we were delighted to be talking plants and to be observing the Korean countryside at eye-level. Unfortunately, the sun had set by the time we were far into our journey, and most of the countryside was driven through unobserved. However, the trip was not without memorable incidents, partially due to the fact that the station wagon was loaded with luggage and supplies for Chollipo. We made a quick stop in a small town for last minute supplies and were delighted to see a small farmers' band playing homemade instruments and parading down the road in the twilight to celebrate the completion of the harvest. Before reaching the last turnoff for Chollipo, the car was hitting bottom along the rutted road, and on taking the last turnoff, the underside of the vehicle took a horrendous beating that culminated in the loss of the muffler as we drove onto the beach of the Yellow Sea (it was low tide) and up the steep drive to the main house at Chollipo Arboretum. After a late dinner, we headed by flashlight to our beds in different guest houses, not knowing what view would meet our eyes in the morning.

The following morning, lying on *tatami* (Japanese bed mats placed on the floor), Happy and I opened our eyes and were stunned momentarily by the magnificent sweep of the Yellow Sea in front of and below us. Our guest house was perched above the beach with a breathtaking view of the coast and an offshore island, which we learned later was a part of the Arboretum property and accessible by foot at low tide. The tides in this area are notable in and of themselves as the second highest in the world and second only to those in the Bay of Fundy between New Brunswick and Nova Scotia, where the tides sometimes rise between 40 and 50 feet. At Chollipo on the Yellow Sea, 30-foot tides occur, and the beaches of white sand make swimming a delight.

The Arboretum property comprises about three hundred acres along the coast of the Yellow Sea and includes the low-lying mountains that curve inland at this point to form a small basin with the fishing village of Chollipo (located adjacent to the Arboretum pro-

perty) on the beach itself. Because of the varied topography, exposures, and soil types, the site is ideally suited to development as an arboretum, and its location near the Yellow Sea has the added advantages of the moderating influences of the sea in extending the growing season as well as providing occasional fogs and mists and tempering the extremes of day- and night-time temperatures.

After breakfast, we spent the morning walking around the nursery areas, which are located adjacent to the main and guest houses at Chollipo, and we were overwhelmed by the vast numbers of plants as well as the diversity of the collection (in excess of four thousand species) that Carl has brought together within the last seven years. I can only liken the experience to walking around the Hillier Garden and Arboretum in Hampshire, England, and it is obvious the Chollipo Arboretum will soon be among the foremost Temperate Zone arboreta in the world. We made numerous collections of seed, our first in Korea, from the plants in the nurseries and growing in permanent plantings. I was particularly interested in studying Carl's collection of Magnolias, which includes upwards of sixty taxa, and we were fascinated by the diversity of the *Ilex* collection that includes upwards of three hundred taxa. Species of both of these genera hold a special fascination for Carl, and his collections are certainly the most comprehensive I have seen. At every turn Dick, Happy, and I were aware





*The rugged coast of the Yellow Sea at Chollipo Arboretum. Note the compound leaves of *Platycarya strobilacea* in the foreground. Photograph courtesy of C. F. Miller.*

of our ignorance and at the same time we were delighted to be seeing either completely new plants or others we had only known by reputation. Carl estimates that the climate at Chollipo is comparable to that of Zone 8 (USDA map), and he is attempting to grow all species from both the northern and southern hemispheres that might prove hardy at Chollipo.

After lunch and a swim in the Yellow Sea, we continued our survey of the plant collections in the Arboretum nurseries, and late in the afternoon we walked down to the sandy beach adjacent to the fishing village of Chollipo, where Carl was anxious to show us and have us collect seed from an extensive population of *Vitex rotundifolius*. Unlike other species of *Vitex*, which are either trees or upright shrubs, this species is prostrate and creeping, and at the collection site served as a sand binder on the low dunes.

On October 3, another clear, beautiful day, we continued our investigations of the plantings at Chollipo, and spent the better part of the afternoon exploring the native vegetation both on Carl's offshore island and along the coast north of Chollipo at Uihang-ni.

The Yellow Sea, terraced rice paddies, and pine forests at Chollipo. Photograph courtesy of C. F. Miller.



The cone-like infructescence of Platycarya strobilacea on a plant growing in the Chollipo Arboretum. Photograph: S. A. Sponberg.

Pine forests cover the low-lying mountains along the coast and the dominant species are *Pinus densiflora*, a species common everywhere in Korea, *P. thunbergii*, and in the Chollipo area the hybrid between the two species, *P. densithunbergii*. Another common conifer in the Chollipo area is *Juniperus rigida*, while common deciduous species in the scrub along the coast and in the forested areas include *Platycarya strobilacea*, an unusual monotypic genus of the Juglandaceae, *Kalopanax pictus*, *Zanthoxylum piperitum* and *Z. schinifolium*, *Elaeagnus umbellata* and *E. macrophylla*, *Vaccinium oldhamii*, *Sorbus alnifolia*, *Euodia Daniellii*, *Carpinus koreana*, *Rhododendron mucronulatum* everywhere in pine forests, and *Quercus dentata*, *Q. mirabilis*, and *Q. acutissima*. Two lindens, *Tilia mandshurica* and *T. amurensis*, are common, while the unusual *Grewia biloba*, also a member of the Tiliaceae, is a frequently encountered shrub.

At Pang-jik-kol, Carl took us to see one of the few known native occurrences of *Koelreuteria paniculata* in Korea, and we were amazed to find this species, which we tend to think of as a tree from 30 to 60 feet in height, growing in sandy soil as a shrubby plant only approaching 12 feet in height. Needless to say, we are hopeful that

the shrubby habit of these plants is genetic and not environmentally induced, as we made a collection of seed and can visualize the horticultural and landscape use of a dwarf, shrubby golden rain tree. Carl also took us to collect seed from another plant, *Viburnum bitchiuense*, that was growing in an unexpected habitat. We found a large population of this low-growing shrub growing in almost pure sand, where, like the *Vitex*, it was serving as a sand binder on the low dunes behind the beach of the Yellow Sea.

We spent the better part of the next day, October 4, back in the nurseries at Chollipo Arboretum, and by mid-afternoon, after lunch and a refreshing swim, had packed and were ready for our return trip to Seoul. Before leaving the topic of our stay at Chollipo, however, note should be made of the wonderful hospitality there and of the superb meals, a blend of western and Korean cuisines, and largely dependent upon the fresh fruits and vegetables grown on the arboretum property. *Ajumoni* (the Korean term applied to housekeeper and/or cook) was responsible for these delightful meals, and special mention must be made of the featured botanical hors d'oeuvres. These included roasted ginkgo nuts, pine nuts, *Tagetes* leaves *tempura-fried*, two species of seaweeds (one prepared rather like Doritos or potato chips, the other with sesame seeds), and popcorn. Other specialties included *kimchi*, the famous Korean hot relish, and a wonderful pie made from the fruits of *Elaeagnus umbellata* that were collected from shrubs growing in the arboretum.

We departed from Chollipo by mid-afternoon leaving vast areas of the arboretum unexplored, but we were able to make several stops to collect en route to Seoul. We were delighted to find a magnificent old specimen of *Gleditsia japonica* var. *koreaiensis*, and stopping in the town of Taean, not far distant from Chollipo, we made what to me was one of the most exciting discoveries of the trip. While Carl took us to an old garden to see an exceptionally fine specimen of an unexpected North American native, *Taxodium distichum*, we spotted a large magnolia nearby. At first glance, we assumed that this tree was a fine, old specimen of the Japanese white-bark magnolia, *Magnolia hypoleuca*, a species that is not an uncommon cultivated tree in Korea. On examining the tree more closely, however, we were astounded to notice that many of the large leaves were deeply lobed at the apex, a characteristic of the Chinese species, *M. officinalis*. This latter species is exceedingly rare in cultivation in North America and is represented primarily by its variety, *M. officinalis* var. *biloba*. While the taxonomic status of *M. officinalis* and its relationship with *M. hypoleuca* remain unclear, we were able to collect numerous seeds from the Taean tree with the use of a ladder loaned to us by the kind but rather mystified owner of the garden.

The fact that this Chinese species was growing in Korea is a reminder of the long history of Chinese influence in Korea. Taean, located near the Yellow Sea, was once the Korean terminus of a trade

route to China across the Yellow Sea, and we speculated that it may have been over this old sea trading route that seed or perhaps plants of *Magnolia officinalis* were introduced into Korean gardens. Chinese influence was evident again the next day in Seoul when Mr. Nam, Carl's driver, took us to the campus of a private school for girls to see the finest specimen of the lace-bark pine, *Pinus bungeana*, that I have ever seen. Like *M. officinalis*, *P. bungeana* is native to China, but despite that fact, the beauty, large size, and great age of the tree we saw growing in Seoul had merited its designation as a living national monument in Korea.

During the afternoon of our day in Seoul on October 5 we were able to visit the Forest Research Institute of the Korean Institute of Science and Technology where we met briefly with the director and then spent a couple of hours with Mr. Cho, a staff member, in the arboretum he has established on the grounds surrounding the administration building. Mr. Cho was most hospitable and allowed us to make numerous valuable collections, including a large collection of the seeds of *Firmiana simplex*. This tree proves perfectly hardy in the Institute's arboretum where winter temperatures fall to -5°F . and the snow cover is light as the winters are generally very dry. Before leaving the Institute, Carl had arranged for us to meet Mr. Cho on the evening of October 7 at the village of Changchon, where we would join him on a collecting expedition in that vicinity on October 8.



On the next day, October 6, we left Seoul and traveled on the Seoul-Kangnung Expressway to the eastern seacoast of the Korean peninsula, stopping once en route to do some roadside collecting. The weather, unfortunately, began to deteriorate rapidly, and to our disappointment we drove through the mountainous terrain in dense fog and rain. We finally arrived at our destination after dark and luckily found rooms in the Sorak-san Hotel, within the limits of the beautiful and mountainous Sorak-san National Park. After getting settled in our western-style rooms, we made a brief excursion into the market and shop area outside our hotel where we were fascinated by the snake and curio shops, many of which were festooned with dried octopus and squid that hung down from the shop doors and walls like curtains. Soon, however, despite the fine drizzle, we were collecting seeds of *Acer triflorum* by flashlight.

The next morning the rain had let up slightly, our spirits were high, and we followed the well-worn path along a rain-swelled mountain stream to a temple on the mountainside; in the rich forests above was a famous area where the mountain stream courses through an extensive cataract. The temple, like others subsequently visited in Korea, was a beautiful old structure, and unlike the temple buildings we had seen in Japan, was wonderfully ornamented and decorated with painted murals. Moreover, the ridge poles of the roof, which extended to form broad eaves, had been painted in intricate patterns in wonderfully bright, primary colors.

Among the seeds we collected along the trail were those of *Sapium japonicum*, a member of the Euphorbia family with magnolia-like leaves, which turn crimson in fall, that is not included in Rehder's *Manual*, and *Hovenia dulcis*, the unusual raisin tree, of the Rhamnaceae. We also were able to locate a few seeds in last year's pods on an old specimen of *Paulownia koreana* that had apparently not flowered during 1977. Despite that fact, the year-old seeds have proven viable and at the time of this writing seedlings are growing in the Arnold Arboretum's Dana Greenhouses.

As we left Sorak-san it was still raining, but we made several stops, one to collect fruits of *Diospyros lotus*, and another at Naksan Temple, which is located directly on the coast above the Eastern Sea (or Sea of Japan), where we collected fruits of *Tilia megaphylla*, another species not listed by Rheder. We retraced our route for a considerable distance, again in rain, and then in pitch darkness headed north to Changchon and our rendezvous with Mr. Cho. After driving over poor roads that had been soaked by rain through sparsely settled, mountainous country, we finally arrived at the village and to our delight found Mr. Cho and several of his colleagues waiting for our arrival. They escorted us to our inn, our first experience with a traditional Korean inn, where we soon had our evening meal and fell into discussion with Mr. Cho over plans for the morning.

We occupied three rooms at the inn, each small and square with sliding rice paper doors that faced out onto an open courtyard and the communal washing place. The rooms are entered off an elevated platform or deck, and one leaves one's shoes on the ground below. Most of the inns are rectangular or L-shaped, only of one storey, and a chimney is located at one end of the building. The area beneath the building is essentially a crawl space in which a fire is built at the end opposite the chimney. The floors are like adobe, and heat from the fire beneath them warms those of the rooms above. A very strong mulberry paper made from local trees covers the floors; the paper is very smooth with a polished surface somewhat like linoleum.

Due to the heavy rains, our schedule was left tentative and it wasn't until late that evening that Happy and I returned to our room to find that several layers of brightly decorated quilts had been spread on our warm floor. We slept soundly with only minor disturbances caused by an occasional rat running on the roof. The next morning we woke to fog and were astounded to see our surroundings in daylight. The small village with its one muddy thoroughfare was undergoing complete renovation of *all* its buildings simultaneously.

Our plans for the day were finalized with Mr. Cho and a modified climb of Kyebang-san was decided upon due to the uncertain weather. We started our climb several miles from the village and it was necessary for Mr. Nam to relay us in shifts to the jump-off point. Our party had increased in size because Mr. Cho had hired several village boys to accompany us as his collectors.

As we left the farmyard, amidst mats spread with drying chili peppers, corn, and thinly sliced squash and the avidly curious stares of several children, the sun began to shine and the day, after all, became one of the most beautiful we had in Korea. We walked through fields where giant radishes (upwards to 3 feet in length with a diameter of a loaf of bread) had been harvested. We passed by fields of millet and stood to the side of the trail as women laden with firewood of large logs and branches in *chiega* on their backs came down the mountainside. One side of the valley had been totally denuded of its forest and Mr. Cho's mission that day was to collect seed for use in reforestation programs across Korea. The forest on the opposite side of the valley, through which we climbed, was exceedingly rich in species composition and was very reminiscent of a well developed deciduous forest of mountainous eastern North America.

We were to make numerous collections as we climbed the easy trail, and in a thicket along a small stream we located one plant of *Magnolia sieboldii* with fruit aggregates, the follicles of which had dehisced to disclose numerous bright red seeds. While we had seen this species at Sorak-san, none was found there with fruits, and we had almost despaired of bringing home to Boston reliably hardy

strains of this wonderful plant. Later, we were to collect a large number of seed of this species from plants in cultivation, but seeing the plant in its native habitat and securing its seeds there was a highlight for me. Several species of maples grew in this beautiful forest, and one, *Acer pseudosieboldianum*, gave us our first encounter with spectacular fall color. Its leaves had turned to a brilliant crimson where the plants were growing in exposed areas along the edges of the forest, while plants of the same species growing in the forest had turned a warm golden-yellow. Another maple, *A. mandshuricum*, one of the trifoliate maples, had not yet assumed its fall color, but its fruits, high up in the crowns of the trees, were abundant. Dick was able to climb high into one of these trees and shook the keys to the ground where Carl, Happy, and I gathered them into envelopes. Huge specimens of *Kalopanax pictus* grew in close association with the maples, and the young boys were dispatched by Mr. Cho to collect their fruits. In a couple of instances the boys failed in their attempts to shimmy up the tall trees. It was amusing to watch and listen as one boy, high up in his tree, obviously urged and then heckled his cohort who was unsuccessful in getting far off the ground on his tree due to the great girth of the trunk and the lack of foot- and hand-holds. As we continued our climb, the dappled sunlight played on the beautiful white bark of *Betula ermanii*, and we were astounded to find huge specimens of *Juglans mandshurica* and another birch, *B. schmidtii*. One specimen of the latter with its peeling, shingle-like, dark gray bark, was perhaps the most magnificent tree we had seen, and I estimated its height at about 60 feet.

Our goal the following day was to visit the temple grounds at Yongmun-san, specifically to see the giant *Ginkgo biloba* tree that grows on the mountainside just below the temple. While the forest trees at Kyebang-san that we had seen on the previous day had been impressive in their size, the Yongmun-san ginkgo dwarfed them by comparison and is probably the largest individual tree any of us had seen previously. The interpretive sign near the tree was in both Korean and English, and according to the information given, this ginkgo, towering to a height of 200 feet, is thought to be the oldest living ginkgo in all of Asia. Unfortunately, the data given did not include the diameter (dbh) of the tree, but we estimated that this would exceed 15 feet. While we scurried from one vantage point to another in an attempt to photograph the tree in its entirety, we were somewhat less than completely successful, yet the accompanying photograph taken from above in the precincts of the temple, gives some idea of the enormous size of this ancient tree.

After leaving the temple we made several interesting collections along the trail to the small village at the base of the mountain, and along the main street of the village we were able to supplement our collections through purchases in the market there. This market



The base of the giant 200-foot, 1100-year-old Ginkgo at Yongmun-san Temple, Kyonggi-do Province, Korea. Photograph: S. A. Spongberg.

Women in the market at Yongmun-san. Note the slabs of acorn curd in the dishpan in the foreground. Photograph: S. A. Spongberg.

reminded me of the open air markets in villages in Mexico, and the diversity of plant materials offered for sale, many collected from the wild, made for a colorful botanical shopping spree. Among the plant materials for sale in the market were cones of *Pinus koraiensis* (for the edible pine nuts), the small red drupe-like fruits of *Elaeagnus umbellata*, *Vitis coignetiae* with its bunches of small, purplish-black berries, the sweet green berries of *Actinidia arguta*, and the small, oblong red drupes of *Zizyphus jujuba*, the jujube, which tasted much like apples. Spread out on mats to dry in the sun were quantities of acorns of *Quercus aliena* and close at hand were water-filled dishpans in which slabs of acorn curd, prepared from the acorns, were floating. Other mats were spread with chilies and thinly sliced squash, while the small, grayish-brown seeds of *Perilla fruticosa* were piled on others. A member of the mint family, *Perilla* is grown for its seeds that are an important source of oil that is used in cooking and for water-proofing paper. Other, more commonplace vegetables and fruits included chestnuts, several varieties of corn, tomatoes, and pumpkins, while crates of apples and apple-shaped yellow pears were displayed along with the tempting, orange fruits of *Diospyros kaki*, the oriental persimmon. Carl also showed us the roots of *Platycodon grandiflorum*, the balloon flower, which are commonly prepared and eaten in soy sauce; there were numerous other roots with Korean names that Carl was unable to translate into Latin ones.



I was particularly anxious to buy several persimmons or kakis, both to eat and to obtain seeds for trial at the Arnold Arboretum. Carl persuaded me that we would have better chances of obtaining hardy strains if we purchased fruits from local farmers, inasmuch as the market fruits may not have been grown locally. He had no problem in convincing me not to buy persimmons, but he was unsuccessful in tempting the three of us to try the delicacies of the several snake shops in the market area. These establishments were clearly recognizable by the cages with live specimens of both venomous and non-venomous snakes, and earlier, on the trail to the temple, we had seen a father and son collecting snakes for the local shopkeepers. After a customer selects the snake of his choice, the proprietor kills, cleans, and prepares a hot snake stew for consumption on the premises, a culinary treat apparently very popular with Korean tourists. We disappointed Carl as we preferred to satisfy our appetites with jujubes and other vegetable produce.

En route from Yongmun-san to Seoul we did stop and buy persimmons of two varieties that were growing in a farmhouse dooryard. One variety was large-fruited, deep rich orange in color with four longitudinal grooves that divided the fruits into quadrants, while the second produced smaller, less attractive, ungrooved fruits of a pale orange color. As luck would have it, the larger more beautiful kakis contained no seeds, but several seeds were found in the less attractive fruits. If we were successful in obtaining a hardy strain we will, unfortunately, have to be content with the less attractive, smaller-fruited form.

After spending a day in Seoul exploring the business and market districts and shopping for souvenirs, we left on the morning of October 11 on our last collecting foray. On this trip we headed south on the Seoul-Suncheon Expressway, and after a brief stop for collecting at the Forest Research Station at Chonju, we continued southward where our objective was Sonam Temple, located about six miles northwest of the town of Suncheon on the mountain Chogyo-san at about three hundred meters above sea level. Once again, we arrived at our destination in darkness and we were forced to stop as the road came to a seemingly abrupt dead end on the forested slope of the mountain. While Carl assured us that there had been an inn there on his last visit to the area four or five years previously, we saw no signs of life. Carl, however, set off on foot, flashlight in hand, while Happy, Dick, Mr. Nam, and I waited by the car.

When Carl reappeared he had two young boys with him from the hidden inn, and he greeted us with the news that the Ajumoni was preparing our evening meal. After dinner, which was served in Carl's room, we headed to our rooms and bed, and once again fell asleep not knowing what view would meet our eyes in the morning. At three o'clock, however, we were awakened by the sounds of drums and cymbals and we realized that our inn was, indeed, on temple grounds.



Carl Ferris Miller and the author purchasing persimmons from a Korean family at Yangpyong Myon. Photograph: R. E. Weaver, Jr.

Early the next morning Happy and I had a quiet, pre-breakfast walk around the then seemingly deserted temple. Large, leafless persimmon trees laden with fruits were silhouetted against the blue of the early morning sky, and we discovered on an adjacent hillside numerous ancient burial urns. After breakfast we explored the forest around the temple and located beautiful specimens of the native Korean *Stewartia* that grow in this region, but unfortunately, we were unable to locate capsules with seed. We did make several additional collections in the area, and during the afternoon, after lunch at the inn, we visited other areas in the vicinity, including the Seoul National University Forest at Kwangyang. We also made a stop at the private garden of a Mr. Kim, an old friend of Carl's, to see his exceptionally fine persimmon trees. Mr. Kim kindly showed us through his garden and then gave us enough ripened persimmons so that even I could satisfy my appetite for these delicious fruits. Included among these kakis was a variety unlike any I had ever seen or heard of, inasmuch as it is sweet and non-astringent when still apple-hard.



Burial urns on the forested slope of the mountain at Sonam Temple. Photograph: S. A. Spongberg.

The next day, after spending a second night at the inn, we reluctantly started back in the direction of Seoul, stopping at another locality in search of *Stewartia* seeds. Although our search for capsules of *Stewartia* was again unsuccessful, we were able to go over the five hundred mark for total collections during our travels in Japan and Korea. We made these last collections with the realization that our Korean adventure was fast coming to a close, and on the long drive back to Seoul our conversation turned to plans for the future and our itinerary for our hoped-for next trip to Korea.

On the morning of October 14, Dick left Seoul on an early flight to return home via the Philippines, while Happy and I ran an errand to the post office to mail off our last collections to the Arboretum and bought a bouquet as a parting gift for Ajumoni. Later in the day after attempting unsuccessfully to express our deep thanks, we left Carl and Ajumoni, and Mr. Nam drove us to the airport for our flight home via Honolulu and San Francisco. While the tangible results of our travels in Korea can be seen in the Arboretum's Dana Greenhouses, and hopefully will be obvious in the Arboretum's living collections in the years to come, for Happy, Dick and me, one of the greatest rewards of our trip was intangible — the opportunity to meet and learn to know and love an astounding and generous man, Carl Ferris Miller.

Itinerary in Korea with Plants Collected at Each Locality

1 October — Departed Japan and arrived Seoul. Met Carl Ferris Miller. Departed Seoul and traveled to Chollipo Arboretum, Sowon-Myon, Sosangun, Province of Chungchong-Namdo.

2 October — Studied and made collections at Carl Ferris Miller's Chollipo Arboretum.

* <i>Alnus maximowiczii</i>	* <i>Magnolia kobus</i>
* <i>Berberis poiretii</i>	* <i>Platycarya strobilacea</i>
* <i>Clerodendron ugandense</i>	* <i>Quercus dentata</i>
* <i>Cornus walteri</i>	* <i>Raphiolepis ovata</i>
* <i>Cotoneaster wilsonii</i>	* <i>Ribes fasciculatum</i> var. <i>chinense</i>
* <i>Desmodium racemosum</i>	* <i>Salvia guaranitica</i>
* <i>Indigofera potaninii</i>	* <i>Sollya fusiformis</i>
* <i>Lindera glauca</i>	* <i>Viburnum setigerum</i>

Walked on beach around the village of Chollipo.

Vitex rotundifolius

3 October — Collected in secondary woodlands at Uihang-ni, near Chollipo, Chungchong Namdo Province.

<i>Euonymus</i> sp.	<i>Symplocos chinense</i> var. <i>pilosum</i>
<i>Lespedeza</i> sp.	<i>Viburnum bitchiense</i>
<i>Platycarya strobilacea</i>	<i>Viburnum koreanum</i>
<i>Quercus variabilis</i>	<i>Vitis</i> sp.
<i>Smilax china</i>	<i>Zanthoxylum piperitum</i>
<i>Smilax</i> sp.	<i>Zanthoxylum schinifolium</i>

* Cultivated material.

Collected in secondary scrub near the Yellow Sea at Pang-jik-kol.

Grewia biloba

Rhamnus koraiensis

Koelreuteria paniculata

Walked at low tide to Carl's Island.

4 October — Made additional collections at Chollipo Arboretum.

**Carpinus coreana*

**Indigofera pseudotinctoria*

**Hemiptelea davidii*

**Pyrus calleryana* var. *fauriae*

**Ilex serrata* var. *sieboldii*

**Setaria*-like Grass

**Indigofera cylindrica*

Departed from Chollipo to return to Seoul, making stops en route for collections.

Dooryard garden near Sowon, Chungchong-Namdo Province.

Gleditsia japonica var. *koraiensis*

Visited old garden in town of Taean, Chungchong-Namdo Province.

**Acanthopanax* sp.

**Magnolia officinalis*

5 October — Day in Seoul.

Residence of Carl Ferris Miller.

**Diospyros kaki*

Visited campus of private girls' school to see remarkable specimen of *Pinus bungeana*.

Visited Forest Research Institute.

**Abelia coreana*

**Ligustrum foliosum*

**Acer barbinerve*

**Ligustrum insularis*

**Alnus japonica*

**Ligustrum salicinum*

**Berberis amurensis* var. *quelpartensis*

**Lindera glauca*

**Betula chinensis*

**Photinia koreana*

**Boehmeria spicata*

**Pterocarya stenoptera*

**Campylotropis macrocarpa*

**Pterostyrax corymbosa*

**Corylopsis coreana* var. *coreana*

**Rhamnella franguloides*

**Ribes fasciculatum* var. *japonicum*

**Diplomorpha trichotoma*

**Rosa koreana*

**Disporum sessile*

**Sapium japonicum*

**Euodia officinalis*

**Ulmus parvifolia* var. *coreana*

**Exochorda serratifolia*

**Zanthoxylum coreanum*

**Lespedeza cuneata*

6 October — Departed Seoul and traveled to Sorak-san National Park, Kangwon-do Province, stopping en route for collections.

Roadside near Myonon, along Seoul-Kangnung Expressway, Province of Kangwon-do, elevation 500–600 m.

Aristolochia sp.

Symplocos chinensis var. *pilosa*

Rhamnus davurica

Tripterygium regelii

Spiraea sp.

Viburnum sargentii

Sorak-san National Park, near hotel, elevation ca. 100 m.

Acer triflorum

* Cultivated material.

7 October — Collected along trail from Sorak-san Hotel to temple and cataract, elevation 100–300 m.

<i>Acer mono</i>	<i>Malus baccata</i>
<i>Acer pseudosieboldianum</i>	<i>Paulownia koreana</i>
<i>Clerodendron trichotomum</i>	<i>Rhus chinensis</i>
<i>Diospyros lotus</i>	<i>Sapium japonicum</i>
<i>Hovenia dulcis</i>	<i>Securinega suffruticosa</i>
<i>Lindera obtusiloba</i>	<i>Staphylea bumalda</i>

Departed Sorak-san National Park and drove to village of Changchon with collection stops en route.

Roadside below Sorak-san Hotel.

Diospyros lotus

Naksan Temple on the eastern Sea, Kangwong-do Province.

**Tilia megaphylla*

Dooryard garden, city of Kangnung.

**Cedrela sinensis*

8 October — Collected at Kyebang-san at Undugol Pass between Sogsa and Changchon, Province of Kangwon-do, with Mr. Cho and colleagues, elevation 700–1000 m.

<i>Acanthopanax sessiliflorus</i>	<i>Magnolia sieboldii</i>
<i>Acer barbinerve</i>	<i>Neillia sinensis</i>
<i>Acer mandshuricum</i>	<i>Philadelphus</i> sp.
<i>Acer tegmentosum</i>	<i>Rhamnus yoshinoi</i>
<i>Alangium platanifolium</i>	<i>Rosa davurica</i>
<i>Euonymus oxyphylla</i>	<i>Tilia amurensis</i>
<i>Lonicera</i> sp.	<i>Weigela</i> sp.
<i>Maackia amurensis</i>	

Left Kyebang-san and drove to Hongcheon for the night, stopping en route for collections.

Between Undugol Pass and Sogsa, roadside scrub.

Berberis amurensis *Lonicera subsessilis*

Private garden, town of Hongsong, Kangwon-do Province.

**Betula davurica*

9 October — Traveled to the temple at Yongmun-san, Province of Kyonggi-do, to view giant ginkgo and to collect along trail.

<i>Acer pseudosieboldianum</i>	<i>Hydrangea macrophylla</i>
<i>Albizia julibrissin</i>	<i>Quercus aliena</i>
<i>Carpinus cordata</i>	<i>Rhamnus davurica</i>
<i>Carpinus laxiflora</i>	<i>Smilax sieboldianus</i> var. <i>inermis</i>
<i>Clematis apiifolia</i>	<i>Styrax obassia</i>
<i>Clematis maximowicziana</i>	<i>Weigela</i> sp.
<i>Deutzia glabrata</i>	<i>Zelkova serrata</i>

Explored market area below temple trail-head.

**Zizyphus jujuba*

Stopped at private garden below temple area.

**Magnolia sieboldii*

* Cultivated material.

Returned to Seoul stopping at Yangpyong Myon, Ibin Iri, Province of Kyonggi-do, collecting in private dooryard gardens.

**Diospyros kaki*

**Magnolia sieboldii*

10 October — Day in Seoul exploring business and market districts and buying souvenirs.

11 October — Departed Seoul for Sonam Temple in southern Korea, stopping en route at the Forest Research Station at Chonju, Province of Cholla-Pukto.

**Acer buergerianum*

**Lindera glauca*

**Alnus firma*

**Magnolia kobus*

**Diplomorpha trichotoma*

**Syringa dilatata*

**Grewia biloba*

**Zizyphus jujuba* var. *jujuba*

Arrived at Sonam Temple for the night.

12 October — Explored forest surrounding Sonam Temple, on the mountain Chogyo-san, ca. 10 km. NW of Sunchon, Cholla-Namdo Province, elevation ca. 300 m.

Boehmeria spicata

Rhododendron mucronulatum

Carpinus laxiflora

Rhus sylvestris

Celtis aurantiaca

Viburnum cf. *erosum*

Celtis koraiensis

Viburnum cf. *koreanum*

Lindera glauca

Spent afternoon collecting in the vicinity of Kwangyang and Sunchon, Province of Cholla-Namdo.

Visited Seoul National University Forest, Kwangyang.

**Abelia mosanensis*

**Euscaphis japonica*

**Aphananthe aspera*

**Photinia glabra*

**Chionanthus retusus*

**Rhus succedanea*

Visited private garden of Mr. Kim in Kwangyang.

**Diospyros kaki*

**Gardenia jasminoides*

Visited old private garden, Sunchon.

**Aphananthe aspera*

**Cephalotaxus koreana*

Visited Forestry & Agricultural Technical School, Sunchon.

**Quercus phillyreoides*

**Ulmus parviflora* f. *lanceolata*

Returned to inn at Sonam Temple for second night.

13 October — Collected at Mudung-san, mountainous area near the city of Kwangju, Province of Cholla-Namdo.

Cudrania tricuspidata

Platycarya strobilacea

Euscaphis japonica

Rhamnella franguloides

Ilex macropoda f. *pseudomacropoda*

Viburnum cf. *wrightii*

Meliosma myriantha

Vitis thunbergii

Miscanthus sinensis

Returned to Seoul.

14 October — Departed from Seoul for return to Boston.



Hydrangea anomala subsp. petiolaris. Photograph: G. Wadleigh.

New Directions for Richard A. Howard

On June 30 Richard Alden Howard stepped aside from administrative duties as the fourth Director of the Arnold Arboretum to devote more of his time to research, writing, and teaching as Professor of Dendrology at Harvard University.

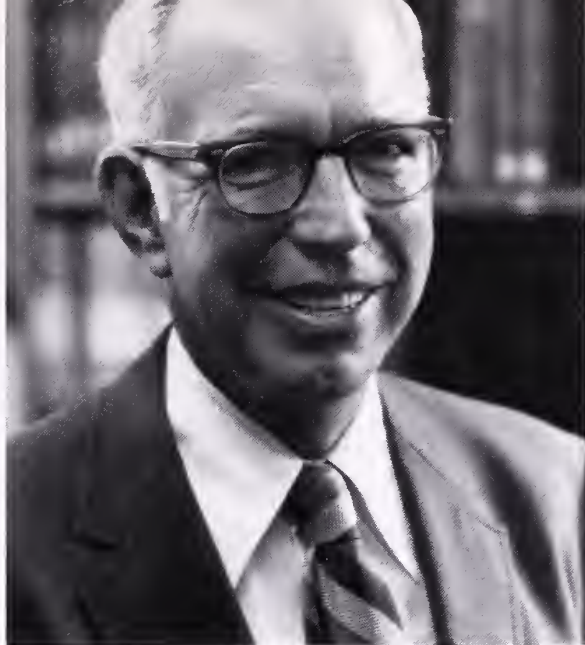
During the nearly twenty-five years of his stewardship, drastic social and economic change has taken place in the United States. For the Arnold Arboretum it has been a momentous time; a period of physical and philosophical growth during which the institution expanded its role in the public domain, strengthened its scientific programs, and developed new activities in its Jamaica Plain, Weston and Cambridge locations.

Howard's administration began with the implementation of the transfer of a portion of the Arboretum staff and research materials to the Harvard University Herbaria in Cambridge. Later the Dana Greenhouse complex was built, becoming a horticultural feature of the grounds in Jamaica Plain; a service area for equipment also was constructed and the Administration Building renovated. Major changes in the collections on Bussey Hill improved the appearance of this area, and the Case Estates of the Arboretum in Weston were opened to the public and developed as a teaching and display site, while continuing to function as a nursery and holding area for living plants of the collections.

In 1972 botanists and horticulturists throughout the world joined in the observance of the Arboretum's centennial which focused on the basic and applied research and contributions of the staff. Simultaneously, a volunteer training program was launched, and the role of the Arboretum in the community began to grow in scope and significance. Of particular note is the collaboration with medical experts at the Boston Poison Information Center who refer calls relating to potentially poisonous plants to Arboretum staff on a twenty-four-hour basis. This vital service has been implemented by an educational film on the subject, as well as a widely distributed handbook; both part of an expanding multi-media public information effort.

Scientific achievements during the past quarter-century have included the initiation of a generic flora of the Southeastern United States, a revision of a manual of cultivated trees and shrubs, and Howard's own study of the vegetation of the Caribbean area, which is being published in parts as a flora of the Lesser Antilles.

Now that his administrative responsibilities have been lifted, Richard Howard will have scant leisure to contemplate past accomplish-



Photograph: P. Chvany

ments. For the next year he will enjoy his first sabbatical leave of absence, aided by a Guggenheim Fellowship to complete manuscript for the remaining volumes of his flora. Ahead is the completion of another project of long development: the studies of the nodal-petiole vascular patterns of families of the Dicotyledoneae. He also plans further studies leading to the typification of the West Indian plants described by Jacquin and by Plumier, studies basic to the characterization of plants of the Caribbean area.

In his post as director during an era of increasing world complexity, Howard has had to wear many hats and serve many constituencies, trying to balance progress with fiscal responsibility and respond to pressures from within the Arboretum and without. Indefatigable and articulate, he has represented it at home and abroad, a facet of his responsibilities he has found particularly rewarding "because of the high regard in which the Arnold Arboretum is held."

Reflecting on the institution to which he has devoted nearly all of his professional career, Richard Alden Howard sees reasons for additional satisfaction — past and future:

"I have been fortunate to be able to build on the strong foundations created by my predecessors and to do this with the support of an excellent staff. To them I owe a great debt gratefully acknowledged. I hope that in my new role I can continue to contribute to the work and reputation of the Arnold Arboretum in equally dedicated support of the leadership of the new director."

Richard Howard's colleagues and friends around the world wish him well in his new directions.

What Can I Grow in the Shade? Suzanne Warner Pierot. New York, N.Y.: Liveright. 221 pages, illustrated. \$9.95..

The garden with more than half to full shade qualifies as a shade garden in this book. The major portion of the text is devoted to a description of, and growing information for, approximately one hundred and seventy plants and shrubs (trees are omitted). The remainder of the book includes a short section on general shade gardening techniques together with an index and five informative appendices. Especially useful in the last are the lists of shade-loving plants by region, the sources for shade plants, and the names and addresses of specialized plant societies.

While no claims are made by the author for the completeness of her list, it should be noted that some fine plants are missing. Surely *Cornus mas*, *C. kousa*, *Deutzia*, *Enkianthus*, *Prunus laurocerasus*, and possibly *Franklinia* could be grown in a shade garden where azaleas are flowering successfully. Some *Lilium* and *Sedum*, *Cornus canadensis*, and *Phlox divaricata*, among others, will bloom happily where hyacinths and hemerocallis thrive.

The gardener who is building his library and his gardening expertise may find this book a useful investment; however, for the initiated shade gardener, *What Can I Grow in the Shade?* will not offer anything new.

B. JUNE HUTCHINSON

Wildly Successful Plants. Lawrence J. Crockett. New York: Macmillan Publishing Co., Inc. 268 pages, illustrated. \$12.95.

Books on weeds have become popular of late, perhaps due to an upsurge of interest in urban ecology and in eating "nature foods." This is a good book, but hardly of the calibre of some of the older, standard works on the subject. The identification guide is basically a summary of the diagnostic features of the plants included, organized more or less in the form of a key. It seems to me a bit cumbersome and overly technical, although the glossary certainly helps to overcome this latter objection.

Each plant is illustrated by a somewhat stylized line drawing that is obviously meant to be more interesting than diagnostic, although most of them are good enough to allow for identification of the plant depicted. The whimsical figure of a human included with each of the habit sketches is a clever means of indicating scale. The text is both interesting and useful. Included are items of folklore and often the derivation of the Latin and common names. Potentially useful are the tips for eradicating each of the plants, although I suspect that most of the people who would buy this book would not be interested in this aspect of weeds.

RICHARD E. WEAVER, JR.

Edible and Useful Plants of California. Charlotte Bringle Clarke. Berkeley, Calif.: University of California Press. 280 pages, illustrated. \$5.95 paperback.

This volume aims to acquaint the average person with the many uses of plants found in California. The author describes both present and past uses, and also gives recipes that utilize many of the plants listed; each, "not just edible, but palatable."

The plants discussed are arranged by ecological communities, making this an excellent pocket guide for campers, backpackers, and scavengers. Although a glossary is provided, the novice will find the plant descriptions a little too technical. There are some very good color plates, but the line drawings are not readily adapted to plant identification.

On the whole, the book is very informative, and a good collection of plant lore and plant utilization. Highly recommended.

ALLAN NASH



Rosa rugosa. Photograph: G. Wadleigh.

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ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Massachusetts, U.S.A.

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ARNOLDIA

The Arnold Arboretum Vol. 38, No. 5 Sept./Oct. 1978

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ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Mass. 02130

*Published six times a year: in January,
March, May, July, September, and November.
Subscriptions \$8.00 per year. Single copies \$2.00.
Second Class postage paid at Boston, Mass. Copyright © 1978 by the
President and Fellows of Harvard College.*

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PETER J. CHVANY, Photographer

Cover: Pistacia chinensis photographed near Wan Hsien, Western Szechuan, China, by E. H. Wilson in April, 1908. This male tree was 80 feet tall and had a trunk circumference of 12 feet.

New Trees for Urban Landscapes

by GARY L. KOLLER

Across North America, nurserymen, landscape architects and horticulturists recommend specific tree species for urban use. Usually the trees are selected because of tolerance to infertile and compacted soils, drought, reflected heat, atmospheric pollutants, salts, and adaptability to limited maintenance.

Because plants are sought that thrive under the widest range of adverse conditions, the potential list of acceptable trees is restricted to perhaps fifty or sixty known and used species, varieties and cultivars. Of this total, perhaps fifteen or twenty are used commonly in a specific location because of availability, ease of transplanting, growth rate and cost.

The urban trees most commonly planted in North Temperate areas include the following: *Acer platanoides*, *Acer rubrum*, *Acer saccharum*, *Cornus florida*, *Crataegus phaenopyrum*, *Crataegus crusgalli*, *Fraxinus americana*, *Fraxinus pensylvanica*, *Ginkgo biloba*, *Gleditsia triacanthos* var. *inermis*, *Liquidambar styraciflua*, *Malus* sp. (Crabapples), *Platanus occidentalis*, *Prunus sargentii*, *Pyrus calleryana*, *Quercus palustris*, *Quercus rubra*, *Sophora japonica*, *Tilia cordata* and *Zelkova serrata*. These species are successful and popular, but there also has been an explosion of cultivars of each. This has resulted in the fact that more and more streets and parks are being planted to a wider array of fewer species of plants. This monoculture of trees can cause disastrous effects if they are attacked by insects and disease. Environmental stresses such as high water table, air pollution, abnormally low winter temperatures or highway de-icing salts also influence the health and well-being of the plants. An example is the American Elm (*Ulmus americana*). Plants across North America have been ravaged by Dutch Elm disease regardless of variation in form, foliage and growth rates, and attempts to locate disease resistant cultivars have been ineffective.

Species diversity in any living community adds long term stability to the total complex of organisms. Because of the few species presently utilized, coupled with the abundance of cultivars, urban foresters often recommend that no city or town plant more than 10% of the total tree population to a single species, including cultivars. Cultivars of a species might show variation in growth rate, form, flowers or autumn coloration, but possess essentially identical resistance, or lack of resistance, to environmental and cultural pressures.

This author believes that the cultivar approach to street tree selection has been overworked and has deprived our urban landscapes of the full richness of species diversity. The Arnold Arboretum traditionally has encouraged the introduction and testing of new plant species such as the following four trees, which have had limited but successful use under urban growing conditions.

Cedrela sinensis
(*Toona sinensis*)

Chinese Cedar

Zone 4?

Height: 50–70 ft.

Spread: 40–50 ft.

Family: Meliaceae

Nativity: China

Chinese Cedar possesses several landscape features that contribute to the success of an urban tree species: it is rapid growing; thrives in a wide diversity of soils; is tolerant of high applications of road salts; and has an open canopy that allows the passage of filtered light. It produces a clear yellow autumn color and the bark has distinctive plates that loosen to become shaggy strips. Most interesting is the fact that the leaves and young shoots can be eaten.

In sunny open situations the tree's habit is upright and spreading, reaching heights of 60–70 feet and spreading 30–50 feet, a shape adapted to specimen use. When the tree is crowded or shaded, however, it tends to stretch upward producing a long thin bole with a spreading tuft of foliage at the top. This habit allows the tree to be used in groves where it develops visually exciting stem clusters.

Cedrela is undemanding from a cultural standpoint. Soil pH can be acid or alkaline; it requires a well drained soil and prefers full sun. Because of its limited cultivation in North America, little to no data has been collected on damage from insects and diseases. Hardiness has been observed to -25°F . During the winter of 1976–77, a large multi-stemmed plant at the Rowe Arboretum in Cincinnati, Ohio, survived with no dieback, according to Michael Dirr of the University of Illinois, Urbana.

Fall is the *Cedrela*'s season of ornamental beauty, for the cool nights and shortening days trigger the change from light green summer foliage color to clear pale yellow which contrasts beautifully with the tan-brown color of the shaggy bark. Seed pods high in the canopy open and fall to the ground, and their resemblance to tiny flowers makes them useful additions to projects using dried plant material for Christmas decorations.

From a landscape perspective this plant possesses several features that may detract from its use. It seeds vigorously, sends up root suckers, and has a useful landscape life of only sixty to eighty years before it begins senescence.

People who are not inclined to grow it for ornamental reasons may want to test *Cedrela* as a food source. The leaves and young shoots



*Left: The edible foliage of Cedrela turns a clear yellow in autumn.
Right: Shaggy bark is ornamental on mature specimens. Photos: G. Koller.*

are very tasty, possessing a distinct flavor somewhat similar to that of onions. According to Dr. S. Y. Hu of the Arnold Arboretum, *Cedrela* is a delicacy in China. Shoots and leaves are picked as they emerge in spring and before the shoots expand more than 4-6 inches. Omelets are made using the following recipe: chop and brown onions; as the onions turn color, add minced shoots and leaves of *Cedrela*. Toss lightly, slowly stir in beaten eggs, add salt and pepper to adjust seasoning and cook to desired consistency. Dr. Hu states that the plant is eaten more frequently in northern China where temperatures are cooler, for in Szechuan and southern areas the young shoots have a bitter flavor.

In mid- to late summer, old leaves are boiled in water and the liquid is used in baths for the relief of heat rash.



Cedrela sinensis growing in a dooryard garden and cropped for edible foliage. Plant photographed by Dr. Richard A. Howard in May 1978, near Peking, People's Republic of China.

During a recent trip to the People's Republic of China, Dr. Richard A. Howard noted that *Cedrela* (*Toona*) is often interplanted in peach orchards where it is kept low and compact by continuous cropping for the edible foliage. In other areas, trees growing beside houses appeared as topiary sculptures for they are frequently climbed for the judicious removal of young stems and leaves.

The wood is reddish-brown, fine-grained and used in China as a substitute for mahogany. It is one of the best of the Chinese woods for furniture and wood details in building interiors.

Cedrela sinensis lining Vernon Road, Mt. Airy, Philadelphia, Pa. Photograph taken October 1976. Plants estimated to be approximately 80 years old. Photo: G. Koller.

Propagation experiments conducted at the Morris Arboretum in Philadelphia have proven that this tree is easily reproduced vegetatively. Best results were obtained by taking hardwood cuttings 6-8 inches long from juvenile or young trees in January or February. The cuttings were inserted in a soil mix of equal parts peat, perlite and sand and placed under mist or in a closed case. Bottom heat was maintained at 80°F. Cuttings rooted and began growth in eight to ten weeks and produced a plant 24-30 inches tall by the end of the first growing season.

According to Arnold Arboretum propagation records, seeds need no pretreatment prior to germination. However, a note indicated that seedlings are highly prone to damping off, so appropriate precautions such as a sterile soil, fungicidal soil drench and good air circulation around the seedlings may be helpful.

We have been unable to locate a commercial source for this tree in North America. However, specimens exist at the following public gardens which may share propagating material with interested nursery-people. Arnold Arboretum; Morris Arboretum; Skylands Botanic Park, Ringwood, N.J.; Morton Arboretum; National Arboretum; University of Washington Arboretum; Planting Fields Arboretum; Dawes Arboretum.



Eucommia ulmoides

Zone 5

Height 40-50 ft.

Family: Eucommiaceae

Hardy Rubber Tree

Spread: 40-50 ft.

Nativity: C. China

The lustrous dark green foliage of this tree is distinct and dramatic enough to set it apart from neighboring trees. The leaves are toothed and deeply veined, and resemble those of the American Elm. Its clean foliage is an asset to municipal arborists for where it has been used it has needed no spray applications to control insects and disease; in fact, no foliage problems have been reported.

Plant habit is variable and ranges from horizontal and wide-spreading branches to more ascending branching producing a rounded form. Ralph Shugart, horticulturist at American Garden Cole, says that young seedlings produce straight stems but tend to be bushy and require corrective pruning for a good branch structure.

Eucommia is the only North Temperate tree that contains latex. During World War II, latex supplies from the South Pacific were restricted because of armed conflict. At this time, *Eucommia* was evaluated to determine its potential for use in creating a domestic rubber supply. The quantity and quality were low and extraction methods difficult, however, and these factors combined to eliminate its use as an economic crop; as a result the tree was almost forgotten.

At some point, street tree plantings were started in Cleveland, Ohio, and Indianapolis, Indiana, and as these trees reach maturity they are proving to be adaptable and desirable, attracting the attention of local landscape architects.





Eucommia is known medicinally as Tu-chung. Here a Chinese man transports bark to market where it will be brewed into tea, valued for centuries as a tonic medicine. Photographed in Yunyang Hsien, Eastern Szechuan, China, in July 1910 by E. H. Wilson.

Limited street tree trials indicate that the trees are tolerant of acid and alkaline soils and require only good drainage. Preferred exposure is full sun as growth rate and plant form are inferior under shaded conditions. They seem to possess a high tolerance to air pollution, which is perhaps due to a thick cuticle and a slick, glossy leaf surface from which dust and dirt easily slide. Tolerance of reflected heat and light, drought and restricted root space seem to be high.

The plant is interesting medicinally, for it has had a long history of use in Chinese herbal medicine and is known as Tu-chung in this context. The bark of *Eucommia* is roasted and used to prepare a tea that lowers blood pressure. In 1976, researchers at the University of Wisconsin analyzed the extract and isolated and synthesized the major anti-hypertension principle. During 1977, the People's Republic of China banned all export of the bark because of its extensive use and limited supply; as a result, bark is extremely expensive and hard to obtain in Chinese-American stores.

Left: Eucommia is valued for its glossy, dark green foliage which is remarkably free of insects and disease. Photo: G. Koller.

Right: Eucommia contains latex, and in this photograph the bark has been arranged to display the elastic fibers. Fruits are shown above. Photographed in Ichang, China, in 1911 by E. H. Wilson.



This male plant of Eucommia has a height of 30 feet and a circumference of 4 feet. Photographed near Patung Hsien, China, in January 1909 by E. H. Wilson.

Young trees are said to flower and fruit at the age of seven years. Insignificant flowers emerge in spring before or with the appearance of leaves. Separate plants are male or female and the female trees bear light green winged fruits $1\frac{1}{2}$ inches long. The fruits contain 27% oil, and in China this oil is extracted for various industrial uses.

Propagation is easily accomplished by use of seeds, which can be collected in the autumn and planted directly into seedbeds outdoors with no treatment of the seed coat. Seeds to be started indoors require sixty to ninety days of stratification at 40°F prior to planting. Germination is rapid and the majority of the seedlings will be 12–18 inches tall at the end of the first growing season, with a few reaching 24–30 inches tall. Ralph Shugart reports that seedlings vary in vigor, leaf size and leaf color.

Chinese literature indicates that hardwood cuttings can be taken from one-year branchlets during early spring, before the leaves unfold. We have not yet attempted to test this propagation method at the Arnold Arboretum.

Commercial sources seem to be nonexistent in New England. The plant is available wholesale from American Garden Cole, Circleville, Ohio.

Pistacia chinensis

Zone 5

Height': 40-60 ft.

Family: Anacardiaceae

Chinese Pistache

Spread: 30-50 ft.

Nativity: China

Pistacia chinensis has achieved popularity as a street tree in southern California, but it is virtually unknown in eastern and mid-western gardens. One might ask why this tree is so little known and grown. I believe it is because the plant's hardiness potential has never been fully evaluated and because there has been so little in the way of publicity promoting this tree species. This author has observed large plants growing at the Glen Dale Plant Introduction Station near Washington, D.C., at the Morris Arboretum in Philadelphia, and at the O. E. White Research Arboretum in Boyce, Virginia. At each location, the plant seemed not only to be surviving, but thriving.

In attempting to evaluate cold hardiness potential, I contacted Dr. William Ackerman of the National Arboretum. He related that scions were received at the Plant Introduction Station in Glen Dale, Maryland, from trees at the Plant Introduction Center in Chico, California. Grafting took place in 1959 and two plants are being grown today. At the end of the 1977 growing season, or eighteen years from grafting, plant A had a D.B.H. of 8 inches, a height of 20 feet and a spread of 16 feet. Plant B had a D.B.H. of 6 inches, a height of 15 feet and a spread of 18 feet. They also have fifteen plants grown from seed in 1962. In 1977, at the end of the fifteenth season, the plants averaged a D.B.H. of 4 inches, were an average of 14 feet tall and had an average spread of 10 feet. Dr. Ackerman further states that the lowest temperature to which the plants have been subjected since they have been grown outdoors in Maryland has been -10°F , with no apparent dieback or structural damage from ice and snow.

Paul Meyer, Curator at the Morris Arboretum, states that their plant had no damage when winter temperatures dropped to -15°F during the winter of 1976-77. Their plant was received as a B&B plant in 1961 and at the time of the coldest weather it was well established in its growing location and sheltered by a hill from sweeping winds.

Michael Dirr has observed one plant fifteen to twenty years old growing in a home landscape in Champaign-Urbana, Illinois. The plant is 15 feet tall and is protected from the sweeping west winds by a house. While the plant hasn't grown well, it has survived temperatures of -20°F during the winter of 1976-77.

During the spring of 1977, the Arnold Arboretum received twenty test seedlings, 6 inches tall, from Monrovia Nursery Co. in California. These plants were left out-of-doors for the 1977-78 winter in an unprotected saran house. Minimum temperature for the winter was -1°F and there was a deep and constant snow cover from early



Pistacia chinensis is valued for its brilliant red to purple autumn foliage. Photo: G. Koller.

January through mid-March. In spring 1978, the seedlings were transplanted to a larger growing area and in late July fifteen plants survive. We are not sure whether the five plants that died off did so because of lack of hardiness or because of transplant difficulties.

These successes are by no means fair or reliable indicators of hardiness, but they do illustrate that the plant may be hardier than generally assumed and cultivation is worth attempting in areas with winter temperatures as low as -15°F . Unfortunately, plants now grown in North America seem to represent limited genetic diversity because most have originated from the same source. To extend the plant's useful landscape range, we need to secure seedling populations grown from northern, high elevation locations in the People's Republic of China or northern areas of Korea.

Pistacia chinensis at the ascent of Fei-Yüel-ling, near Tung River, China. Tree has a height of 80 feet, a stem circumference of 10 feet, and is growing at an altitude of 6500 feet. Photographed in August 1908 by E. H. Wilson.



The compound leaves of *Pistacia* are an ornamental reddish-purple as they emerge, turning to a light green at maturity. Autumn color ranges from yellow-orange through reddish-purple and color varies among seedlings; individual seedlings differ from season to season. Dr. Skimina of Monrovia Nursery Co. reports that in southern California trees are not colorful but in cooler areas the autumn foliage ranges from orange to red. Dr. S. Y. Hu recalls that during her childhood in the People's Republic of China an annual event was a trip to Senyatsen Tomb National Park near Nanking to see the brilliant autumn display provided by Chinese Pistache.

In this species, sexes are separated into male and female trees. Flowers are insignificant, but, according to Dr. Ackerman, fruiting clusters are extremely ornamental, frequently with a mixture of blue-green (fertilized) and bright red or sometimes white (unfertilized — with empty seed capsules) fruits in the same or adjacent fruit clusters. Growth seems to be more rapid in male plants.

All people questioned stated that this tree is free of insects and disease, easy to transplant and tolerant of urban conditions, adapting to acid or alkaline soils. One notable attribute is adaptability to drought conditions, perhaps due to its tap root which provides strong anchorage as well as the ability to reach deeper water sources. *Pistacia chinensis* requires good soil drainage and exposure to full sun to encourage optimum growth and best form.

The pinnately compound foliage creates an open canopy allowing the passage of filtered light. Correspondents observe that small groves of the plant are often more effective visually than are single specimen plants.

Growers state that the plant is somewhat floppy in youth and requires staking and corrective pruning in order to develop good structure and a high canopy. General concensus from the nurserymen and landscape architects who know and grow this plant is that *Pistacia chinensis* deserves more widespread use.

While this plant has potential modern applications, ancient and traditional uses are many. According to the *Illustrated Manual of Chinese Trees and Shrubs* by Chen Yung, the wood is light yellow, fine-grained, and in China is used for furniture, farm implements, stakes and carving. Monks in the mountains of Chekiang and Hupeh pick and dry the tender young shoots for later use as a tea. The fruits are gathered by farmers and pressed to remove the oil which is used in cooking and to fuel lamps.

Pistacia chinensis is easily propagated by seeds. Prior to planting, the pulp should be removed and the seed should be soaked in water for sixteen hours. No information was discovered regarding vegetative propagation of this species.

Plants are available wholesale from Monrovia Nursery Co., in Azusa, California.



Sorbus alnifolia

Zone 5 (4?)

Family: Rosaceae

Height: 30–60 ft.

Korean Mountain Ash

Spread: 25–50 ft.

Nativity: China, Korea, Japan

Korean Mountain Ash combines abundant flowers and fruit production, golden to orange-bronze autumn color and attractive smooth gray bark, giving it a multiseason landscape value and making it the perfect choice for the home as well as the urban setting.

Flat-topped terminal clusters of single white flowers $\frac{3}{4}$ -inch across appear in early May; young trees show alternate-year flowering and fruiting characteristics. Highly ornamental small, pea-sized fruits ripen in September and vary in color from bright reddish-pink to reddish-purple, color being dependent on seedling variation. As the fruit ripens, the leaves change from dark green to a stunning blend of oranges and browns. The autumn foliage provides a colorful stage to highlight the outer fruit clusters; the inner clusters are hidden. Autumn color is most effective after the leaves have fallen away and the small reddish-pink fruits stand alone. Due to the abundance of fruits and the bright coloration, they provide a glow or aura to the tree in the waning autumn sunlight.

Growth rates are moderate in young trees and slow as the tree reaches maturity. Habit varies depending on training during young stages. The plant can be grown single-stemmed by encouraging



Sorbus alnifolia combines golden to orange foliage and bright red to purple fruit for a stunning autumn display. Photo: G. Koller.



Smooth gray bark is a year-round landscape asset for Sorbus alnifolia. Photo: G. Koller.

branching to begin at the 8- to 10-foot level. Where space is available, the tree can be grown multistemmed from directly above the soil level and will develop into a huge rounded mass 40-50 feet tall.

During the winter the rounded silhouette is enhanced by the tracery of the smooth silver-gray stems and larger branches. The branches are strongly upswung giving rise to narrow crotch angles which one would assume to be structurally weak. However, this author's observations fail to reveal a propensity to damage from ice loads and strong winds.

Sorbus alnifolia adapts to an acid or alkaline soil pH and is not particular as to soil type as long as drainage is adequate. Fibrous branching roots contribute to ease of transplanting and rapid re-establishment.



Sorbus alnifolia can be grown multistemmed or headed up to create a single stemmed street tree. Mature habit is rounded. Photo: G. Koller.

Preferred exposure is full sun. While this species thrives in a wide climatic range along the East Coast and Midwest, it seems to perform best in cooler areas from the ornamental perspective of autumn foliage and fruit color. Damage from insects and disease are minimal, although this author has seen mild cases of leaf spotting and the tree is said to be susceptible to fire blight.

Mountain-ash (*Sorbus aucuparia*), a related species, has been widely used as a street tree in some northern areas. However, success has been greatly reduced because it is prone, especially under stress, to attack from stem borers which cause the tree to decline and die at an early age. *Sorbus alnifolia*, on the other hand, seems to resist borers, giving this species the attribute of longer survival potential under urban conditions.

Korean Mountain Ash is easily grown from seed which is collected in the autumn, cleaned of fleshy pulp and placed in outdoor seedbeds for germination the following spring. Indoors, a cold stratification at 40°F for sixty days ensures optimum germination.

During spring 1979, this plant will be available in the Boston area from Seltzer's Garden City, Inc., in Newton, and from Weston Nurseries in Hopkinton; it is available wholesale from Princeton Nurseries in Princeton, New Jersey. Seeds may be obtained from Koryodang International Flower Service, Central C.P.O. Box 1718, Seoul, Korea.

In this article I have proposed four trees that are old-timers in American botanical gardens and may prove to be tough, adaptable materials for urban landscapes. What is needed now is a group of progressive nurserymen, street tree commissioners, landscape architects and individual homeowners who will install test plantings for long-term evaluations under a variety of growing conditions. Only in this way will we adequately determine the cultural and environmental adaptability of these new trees for urban landscapes.

First Impressions of the Arnold Arboretum

by MICHAEL DIRR

First impressions are often the most critical and permanent in one's assessment of a person, place or plant. Presently I am on sabbatical leave at the Arnold Arboretum of Harvard University and have literally fallen in love with the institution. If one is interested in studying, photographing and enjoying hardy woody plants, then the Arnold Arboretum is the place to visit. Nowhere else (and I have visited a plethora of plant collections) are the species and cultivar diversity so rich, the records so profuse and creditable, the library so voluminous, the propagation so detailed, and the people so enthusiastic. The Arnold Arboretum is truly America's greatest garden. I have come to appreciate it as a treasure trove of woody plants unrivaled on the North American continent and perhaps the world.

Traditions ooze from every nook and cranny of the Administration Building and one feels that somewhere in the shadows (and there are many) lurk the spirits of Charles S. Sargent, the indomitable first director; Ernest H. Wilson, the great plant explorer; and Alfred Rehder, whose literary contributions are the standards by which other botanical and horticultural offerings are gauged.

The historical aspects of the Arboretum are well documented through the writings of Sargent, Wilson, Wyman and Sutton. The institution is steeped in tradition and there is a type of magic in the name Arnold Arboretum. Among botanists, horticulturists and gardeners, the Arboretum is a household word and this cannot be said of any other institution. The Arboretum's staff has made numerous literary contributions to botany and horticulture. I think of Sargent's classic work, *Manual of the Trees of North America*, with the excellent drawings by C. E. Faxon. Rehder's *Manual of Cultivated Trees and Shrubs* is considered the bible for woody plant identification. Presently Stephen A. Spongberg is revising Rehder's *Manual* and incorporating his own unique ideas and style which will result in a better publication than the original. Wilson's prosaic descriptions of the Arnold Arboretum's collections in the *Aristocrat* series make for relaxing reading. Wyman's books, *Trees for American Gardens*, *The Gardening Encyclopedia*, and others provide tremendous visibility for the Arnold and actually have opened the living collections to the gardeners of the world. His books were the most popular texts for woody plant material courses through the 1950's and 1960's.

Willingly, or otherwise, Wyman influenced several decades of horticultural students.

The two periodicals, *Arnoldia* and the *Journal of the Arnold Arboretum*, are vehicles for the dissemination of popular and scientific information, respectively. *Arnoldia* can be appreciated by the lay gardener as well as the scientist. Articles may range in scope from wreathmaking and the Director's report to excellent treatises on specific plants. Specific issues may treat poisonous plants or, as in the case of Robert Hebb's "Low Maintenance Perennials," consume several issues and assume book status. *Arnoldia* articles are written for enjoyable and informative reading. One does not have to read through a glossary to make sense of the various offerings. My University of Illinois students are introduced to *Arnoldia* and many become subscribers. *Arnoldia* is a great literary bargain in the vast sea of horticultural literature. The *Journal* is much more scientific and represents a scholarly (refereed) vehicle for taxonomic research. I have browsed and read many arboretum and botanical garden publications and for quality and quantity of information none compares with *Arnoldia* or the *Journal*.

The Arboretum library offers an excellent selection of periodicals and books. References that are not available in the University of Illinois library (fourth largest in United States) have found their way into the Arboretum stacks. The library also houses unusual items, such as John Wister's *Swarthmore Plant Notes*. These volumes are laden with Dr. Wister's evaluations of the plant collections at Swarthmore College and represent a tremendous compilation of horticultural information.

The Arnold has maintained good records through the years. Painstaking record keeping might seem like an obvious necessity for every arboretum, but in reality seldom occurs. The Arnold's collection is of documented, authentic origin which is a tremendous attribute for serious researchers. Propagation is one of my research, as well as avocational, interests and these records have proved invaluable.

The Arnold's herbarium contains one of the most complete collections of cultivated plants in the world. Most people cannot appreciate the herbarium aspect of an arboretum, but it is as important as the library, the living collections, and the records.

My principal reason for coming to the Arnold on sabbatical was to work with the living collections. It is here that I derive the greatest satisfaction. I am a plantsman and would as soon study plants as eat. Some days I find myself lunching at 3:00 p.m. simply because I became so engrossed in the collections. I have asked myself repeatedly that if this sort of thing is occurring when green is the dominant color, what will happen in fall and spring?

Allow me to share some thoughts and opinions related to specific members of the living collections. When I walk through the maple collection I wonder why *Acer griseum*, paperbark maple, *Acer mandshuricum*, Manchurian maple, *Acer triflorum*, three-flower maple,



The mature bark of Acer triflorum is ash-brown, loose, and vertically fissured.
Photo: D. Wyman.

and *Acer mono*, painted maple, do not play a more prominent role in modern landscapes. Our gardens are poorer because of their paucity. Their small stature, fall coloration, bark, insect and disease resistance are unrivaled. Unfortunately, propagation difficulties limit wholesale distribution. The maples are a diverse group and the range of aesthetic attributes places them at the forefront of all landscape plants.

The *Phellodendron amurense*, Amur corktree, along Meadow Road is one of my favorites. Although old age and physical abuse are contributing to decline, it remains one of the most picturesque of all Arboretum offerings. The low-slung, corky-textured branches curve skyward and terminate in flat tiers of foliage. In this same area the *Tilia*, lindens, almost overwhelm one in late June and July with their enticing fragrance. *Tilia* × *euchlora*, Crimean linden, *Tilia japonica*, Japanese linden, *Tilia petiolaris*, pendent silver linden, and *Tilia tomentosa*, silver linden, are my favorites. The *Aesculus*, buckeyes and horsechestnuts, meld with the lindens and provide a fine show during May. A valuable exception is *Aesculus parviflora*, bottle-brush buckeye, which produces white, cylindrical, bottlebrush-shaped inflorescences in July. This is one of the very finest native shrubby landscape plants for sun or shade, yet is uncommon in American gardens.

The shrub collection is a favorite haunt and I attempt to walk through a portion every day. The *Vitex*, chaste trees, and *Potentilla*, cinquefoils, offer late season color. *Buddleia*, butterfly-bush, could not have been more appropriately named and a rose called 'Arnold' flowers out of synchronization. The rose hips of glistening orange and red attract my camera. I do not always know where to turn next for there never seems to be sufficient time for everything. *Clethra alnifolia*, summersweet clethra, white and pink, spice the garden. The bees treat them provincially and often I am buzzed as I attempt to secure a close-up.

The forsythia and lilacs are resting and appear nondescript during the summer and autumn months but will become the stars of Bussey Hill Road next April and May. Further on the *Halesia*, silverbells, rank among my favorites with their pendulous, white, bell-shaped flowers. They are four-season ornamentals and deserve wider useage. In the same area (Center Street beds), one finds the *Styrax*, snow-bells, more handsome specimens of which I have not seen. At the end of a grassy path between the *Ilex*, holly, and *Corylopsis*, winter-hazel, resides a spectacular *Parrotia persica*, Persian parrotia. Parrotia is a member of the witch-hazel family with pest-resistant foliage, quilt-work bark, and a uniqueness that defies description. E. H. Wilson would have certainly called this an 'Aristocrat'.

The conifers, hornbeams, beeches, and birches are worth more than a casual look. Crabapples, hawthorns, and mountain-ashes appear endless. The Chinese walk, before the summit of Bussey Hill, is laden with outstanding plants. The *stewartias*, whether in flower, fall color, or bark are spectacular. There is an impressive specimen



Winter outline of Tilia tomentosa emphasizes the uniform growth habit and smooth gray branches.





The graceful, flowing outline of Aesculus parviflora makes it an ideal choice for shrub borders and underplantings. The adaptability to full sun or heavy shade permits its use in many landscape situations.

of *Chionanthus retusus*, Chinese fringetree, which in flower has been likened to a fleecy dome of snow. The oldest paperbark maple in this country is nestled among the stewartias. The infamous *Davidia involucrata*, dove tree, for which E. H. Wilson endured much pain and suffering, resides in this most exclusive of neighborhoods.

If I seem enthusiastic it is not without reason, for the Arnold possesses a great collection of woody plants. The institution is not immune to problems, however. The Administration Building is showing its age and needs refurbishing; the city has encroached and encircled the Arboretum making it more vulnerable to the invasion of man; and many of the plants are old and require considerable maintenance to keep them in presentable condition.

Tradition tends to dictate the Arboretum's practices and programs where innovation and change would prove most beneficial. I envision a computerization of records so that information storage and retrieval could be easily facilitated. Photographic equipment could be updated and perhaps an artist/photographer added to the staff. Plant breeding might be initiated and propagation research could be expanded to include tissue culture. Although woody plants have proven rather difficult to propagate by this method, what better place to advance the frontiers than at the Arnold Arboretum?

The Arnold is the best at what it does and can be even greater. Its publications rank among the best in botanical and horticultural literature. It has contributed much to American gardens. Perhaps more has been given than will ever be received or properly recognized. It is America's Greatest Garden.

Michael Dirr is Associate Professor of Horticulture, University of Illinois, Urbana. Currently on sabbatical, he is a Mercer Research Fellow at the Arnold Arboretum.



The beautiful flowers of Stewartia are evident in July when most gardens suffer from a paucity of color. Photo: P. Bruns.

New Director Is Appointed

Peter Shaw Ashton, formerly Senior Lecturer in Botany at Aberdeen University, Scotland, became the fifth Director of the Arnold Arboretum on July 1. He succeeds Richard Alden Howard, who resigned from the post to devote full time to research on subtropical plants.

An expert in plant classification and the flora of the Asian Tropics, Peter Ashton was born in 1934 in Boscombe, England. He attended Stowe School in Buckinghamshire and received his M.A. and Ph.D. degrees in botany from Cambridge University.

Between 1957 and 1962, Ashton spent three years in Brunei (north-west Borneo) and two years in Cambridge, England, serving as Forest Botanist to the Government of Brunei. From 1962 to 1965 he was Forest Botanist to the Government of Sarawak (northern Borneo), and in 1965 became United Nations Consultant in Forest Botany to the Special Fund Development Project in southern Cambodia. In 1966 he began teaching at Aberdeen University as a Lecturer in Botany; since 1972 he has held the post as Senior Lecturer.

Ashton, whose research and teaching interests include tropical biology, trees, and ecology, has conducted botanical research in Ceylon with the Smithsonian Institution, and in Malaya for the Royal Society of London and the International Biological Programme. A Fellow of the Royal Society of Edinburgh and of the Linnaean Society of London, he is the author of several books and numerous papers on the taxonomy of dipterocarp trees and the ecology of far eastern rain forests.

Peter Ashton, his wife, Mary, and three children (Peter Mark, Mel-lard John, and Rachel Mary) will make their new home at the Arboretum's Case Estates in Weston.



ARNOLDIA REVIEWS

A Quest of Flowers: The Plant Explorations of Frank Ludlow and George Sherriff. Harold R. Fletcher. Edinburgh: Edinburgh University Press. xxix and 387 pages (includes botanical index and general index). Illustrated. £10.

Frank Ludlow, naturalist and educator, and George Sherriff, professional soldier, met in Kashgar in the winter of 1929. Finding that they shared an interest in the flora and fauna of the eastern Himalayas, they planned a series of expeditions to systematically cover the Himalayas of Bhutan and Tibet. Between the years 1933 and 1949, they produced numerous botanical discoveries, introducing to England countless plants that had been overlooked by earlier explorers of the same territory, primarily within the genera *Rhododendron* and *Primula*. Their extensive and detailed notes on each collection were of great importance in the taxonomic classification of the Himalayan flora.

This volume, compiled largely from the diaries and correspondence of Ludlow and Sherriff, will give the reader a vivid image of the land, the people, and the plants of the eastern Himalayas, as well as a feeling for the two explorers as individuals. In all cases of plant collections, the specimen's collection number is noted, increasing the book's value to the botanist. As is generally the case with accounts of such expeditions, the book abounds with descriptions of exotic locales and excellent photographs of the terrain and of individual plants. The photographs have all been reproduced in muted tones and with their corners cropped diagonally to give the impression of old prints in a scrapbook. To some this might seem too "cutesy," but I found it pleasant.

One annoyance, however, was the type style used. The "t" consistently appears to be wearing an *accent aigu*, and the Italic style includes characters (notably the "d" and "h") that are considerably more decorative than readable. This reviewer found it quite impossible to read for any length of time without eyestrain — very irritating when the subject matter was so engrossing.

JENNIFER HICKS

Major Medicinal Plants. Julia F. Morton. Springfield, Ill.: Charles C. Thomas. 431 pages, illustrated. \$49.50.

The word pharmacognosy means the study of drugs and other economic products obtained from natural sources. The formidability of the term prevented the author from using it in the title, but that is what the book is about. She has written for two groups: (1) the pharmacologic students who need a reference source in a field that has become relatively neglected in the curriculum, and (2) the consuming public. The latter group is particularly important because recent years have seen the laity acquire an unprecedented thirst for knowledge of things medical and a strong interest in the consumption of natural products, both food and drugs.

I am not equipped to enter the discussion alluded to by the distinguished professors who wrote the forewords, as to how far the curriculum of schools of pharmacy should continue this movement away from natural products and towards synthetic drugs and their clinical uses. But I can vouch for the great interest the volume holds for the consumer group.

The major medicinal plants are arranged according to their twenty-eight families and are listed with scientific and common names and synonyms. Dr. Morton has set up each chapter under parallel headings so that the sources, preparation, constituents (active principles), medicinal uses and toxicities are not omitted in any. One can find without difficulty

that reserpine is the most active ingredient of *Rauvolfia serpentina*, or Serpent-wood of the Dogbane family, Apocyanaceae, and that it is native to Southern Asia where it was used for snake bite and nervousness for 4,000 years before its modern recognition for the treatment of high blood pressure. The methods of cultivation of the plant and the extraction of reserpine are outlined in detail, as are its toxic effects if the doses are too large. All the other products are treated in the same manner. Some of them are familiar, such as castor oil (*Ricinus communis*); some not, such as cade oil (*Juniperus oxycedrus*) for dermatitis. Some are an essential part of our therapeutic armamentarium; for example, digitalis for heart disease (*Digitalis purpurea* or foxglove). Others are not, such as marsh-mallow (*Althaea officinalis*) used as a demulcent and emollient (incidentally, no longer an ingredient of the confection).

The orderly arrangement is carried into two appendixes. The first is a list of plants that, although still listed in the Pharmacopoeia and used in patent medicines, have fallen into clinical disuse. Examples are *Salicin* from *Salix*, the original source of aspirin, which is now made synthetically, and witch hazel from *Hamamelis*. The second appendix is a list of plants that are used only as vehicles, lubricants, and flowers. Examples are the alga, *Furcellaria fastigiata*, or Danish agar used for suspensions and foams, and *Smilax aristolochiaefolia*, or Mexican sarsaparilla, a familiar flavoring agent.

Since most medicinal plants are toxic in overdose, the book is also of concern to those dealing with the effects of poisonous plants on man and animals. The illustrations are good, the index useful, and the author has placed a list of six hundred references at the end as a guiding hand for those who wish to proceed further.

In sum, it is a scholarly work on a subject with a wide interest.

RICHARD WARREN, M.D.

Ehret: Flower Painter Extraordinary. Gerta Calmann. Boston, MA: Little Brown (a New York Graphic Society Book). 160 pages with 95 plates in color and black and white. \$32.50.

George Dionysius Ehret (1695-1769) rose from obscure beginnings as a gardener in Heidelberg to become one of the most significant botanical and horticultural illustrators through his efforts for the authors of his lifetime — Sir Hans Sloans, Philip Miller, C. J. Trew, Joseph Banks, and Carl Linnaeus, among others. Mrs. Calmann has written of Ehret's life and associations, citing from correspondence and published works in such a way as to bring the man back among us. Ehret's likes and dislikes, his attention to dissections and botanical detail, his search for patrons and a steady income, his intrigue with new plant material, his preference for living material in contrast to dried specimens, and his prolific lifetime production are well described. She estimates that more than 3,000 of his drawings are extant, and she was able to visit the outstanding collections of his work preserved in England, France, Germany, and the United States.

The drawings selected for reproduction are representative of the development of Ehret's style, and each item is documented so as to present location. The incorporation by Ehret of details and dissections, of insects, butterflies, and snails, and his use of descriptive legends and dedications are well shown. The text contains many references to notes supporting each chapter. Useful indices are given to plants and to persons.

Most teachers, and taxonomists in particular, will value the color reproduction of Ehret's "Tabella" of Linnaeus' Sexual System of Plant Classification, which has been available, generally, only in smaller size and in black and white. Those interested in the history of botany and horticulture will find many useful anecdotes and references. This is a book to read with pleasure, to leaf through to enjoy the pictures, or to use for the immense reference value contained.

RICHARD A. HOWARD

Die Hölzer Mitteleuropas, Dietger Grosser. Springer-Verlag: Berlin, Germany. 208 pages, illustrated, packet charts. U.S. \$43.20.

Unhappily, the high price (20¢ a page) and the text in German will dissuade many from purchasing this excellent small volume. The first section of the book is descriptive and explanatory for general wood anatomy. Diagrams, light photographs, S.E.M. photographs, and charts are used effectively in presenting concisely what is generally verbose and elaborate in anatomy texts.

The second section describes and illustrates the wood of common genera of central Europe. Seven genera of conifers and fifty-one genera, representing thirty-two families, of woody Dicotyledoneae are treated, often with several species of the important genera. Text material describes the general appearance of the plant, its use or distribution; the macroscopic characteristics of the wood and the microscopic characteristics, in distinctive paragraphs. Usually four illustrations form a facing plate, with 25x and 75x magnifications of the cross section, and the radial section usually twice the magnification of the tangential, so that the appropriate characters are well known. The inclusion of such genera as *Ilex*, *Buxus*, *Hedera*, *Philadelphus*, and *Daphne* indicates the unusual coverage offered. The volume would be extremely useful in a plant anatomy class that uses campus plants for study.

Two drawbacks should also be mentioned. Several of the plates are foldouts; these buckle with a few uses and must be trimmed. While all the text is on glossy paper, the low quality of the paper of the packet and of the three folded tables is regrettable. One of these, a tabular summary of all taxa included in the text, with vessel element, fibers, rays, and parenchyma, will not stand the long use it is apt to receive.

RICHARD A. HOWARD

Gentians. Mary Bartlett. Blandford Press: Poole, Dorset, U.K., 160 pages, illustrated. £3.25.

Basically this is a fine addition to the list of excellent books on Gentians for the gardener. The first half is devoted to discussions of various aspects of the history and cultivation of this wonderful group of plants, and the last half is made up mostly of individual accounts of about fifty of the commonly cultivated species, giving descriptions and cultural tips. Although the book was written for British gardeners, the cultural information generally is valid for us in the United States except that a number of the species included are tender or otherwise culturally unsuited to the climate here in the Northeast.

I can find little fault with the correctness of the information included, and it is well presented. The treatment of taxonomically difficult species complexes, such as *Gentiana acaulis* and *G. verna*, and their relatives, is handled sensibly. The chapter on hybrids is the most complete account of this subject presently available, and the sections on South American and New Guinean Gentians are unique in the horticultural literature. The only serious flaw is the treatment of *Gentianella*. Most authors ignore the very obvious and taxonomically valid distinctions between this genus and *Gentiana*, so I must give Ms. Bartlett credit for trying. But her chapter on *Gentianella* includes only the "Fringed Gentians" which some authorities include in another genus, *Gentianopsis*. The chapter on annuals correctly assigns most species to *Gentianella*, except for *G. bulgarica*. Finally, the New Zealand and South American species are included under *Gentiana* while they are obviously *Gentianellas*.

The book is well illustrated with generally good color photographs and clear line drawings. Some of the drawings are unfortunately redrawn from previously published works without acknowledgement, one which I recognize being *The Gentians of Canada, Alaska, and Greenland*, by J. M. Gillett.

RICHARD E. WEAVER, JR.



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ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Massachusetts, U.S.A.



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ARNOLDIA

The Arnold Arboretum Vol. 38, No. 6 Nov./Dec. 1978

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ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Mass. 02130

*Published six times a year: in January,
March, May, July, September, and November.
Subscriptions \$8.00 per year. Single copies \$2.00.
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Cover: Richard and Elizabeth Howard. Pencil drawing by Karen Stoutsenberger.

The Director's Report

THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1978

In retrospect the fiscal year just ended was momentous in many ways. Two members of the staff, Dr. Stephen Spongberg and Dr. Richard Weaver, Jr., completed one and one-half months of field work in Japan and Korea, collecting seeds and plants for addition to the collections of the Arnold Arboretum. Their trip represents the first field expedition for horticultural purposes in temperate Asia since the last trip of E. H. Wilson in 1917-1919.

Dr. Shiu-Ying Hu, retired, made a personal trip to the People's Republic of China, and Dr. Richard Howard was a member of the official delegation of the Botanical Society of America visiting selected botanical gardens and botanical, horticultural, and forestry institutions in eight cities of the People's Republic during a twenty-eight-day period. Although only a few seed lots were collected from the wild during Dr. Howard's trip, an official exchange of seeds and herbarium specimens was implemented. The possibility of expeditions and the exchange of personnel seems realistic in the near future; the exchange of specimens and literature and, certainly, freer communication appear to be immediate.

Within the living collections, phase one of the boundary improvements was implemented with reconstruction of gates and sidewalks in the Forest Hills-Arborway area. Unfortunately, the Adams-Nervine property could not be obtained for expansion of the collections.

Two major snowstorms set weather records for the Boston area, with the total snowfall in Boston in January recorded as 35.9 inches, and in February, 27 inches.

In Cambridge, the Harvard Corporation approved the plans for an addition to the Harvard University Herbaria building, and the building plans were placed for bidding at the end of June, with construction to begin in August.

Finally, as an end to one administration and the beginning of another, Dr. Howard requested relief from the administrative duties of director which he has had since February 1, 1954. The Dean and the President accepted this request effective June 30, and the Corporation approved the appointment of Dr. Peter Ashton, University of Aberdeen, Scotland, effective July 1, as the fifth director of the Arnold Arboretum with a concurrent appointment as Arnold Professor of Botany. After a sabbatical year as a Guggenheim Fellow, Dr. Howard

will be Professor of Dendrology on the staff of the Arnold Arboretum and within the University. Dr. Bernice Schubert was appointed acting director for Cambridge and Dr. Weaver, acting director for Jamaica Plain and Weston for the three-month period, July 1 through September 30, 1978.

Staff

June 30 marked the retirement of Mr. George H. Pride from the staff of the Arnold Arboretum. Mr. Pride joined the staff in July 1967 as Associate Horticulturist, with responsibility for the programs in education, the Friends of the Arnold Arboretum, and much of the publicity and film development. He represented the Arboretum well in community activity, especially in the Roxbury-Dorchester programs, and was honored by them at a special dinner. He also received a citation from United States Senator Edward Brooke and a gold medal from the Massachusetts Horticultural Society for his contributions to inner-city horticultural programs. The staff expressed its appreciation to George Pride in a retirement party, as did the participants in the highly successful lecture series which he conducted for many years at the Case Estates in Weston.

Mr. Alfred Fordham, who retired as propagator last year, received an Honorary Life Membership in the International Plant Propagators' Society at a meeting in Columbus, Ohio. He is only the fourth distinguished horticulturist to be so honored.

Dr. Howard was doubly honored when he received the Liberty Hyde Bailey Medal from the American Horticultural Society at the annual meeting in Pasadena, California, and later, in Boston, when he was presented the George Robert White Medal by the trustees of the Massachusetts Horticultural Society for his work in horticulture and botany. Dr. Howard has received a Guggenheim Fellowship for the period June 15, 1978, through June 14, 1979.

Resignations were received during the year from Mr. Kenneth Shaw in horticulture, and Ms. Susan Farwell and Ms. Sandra McLeod in the library. Dr. Burdette Wagenknecht, while on sabbatical leave from William Jewell College in Liberty, Missouri, was appointed a Mercer Research Fellow at the Arnold Arboretum for the spring semester.

Horticulture

Inherent in the title Arnold Arboretum is the development, maintenance, and use of a collection of woody plants. In fact, the indenture establishing the Arnold Arboretum called for the acquisition of all the trees, shrubs, and herbaceous plants hardy in the vicinity of West Roxbury. The national and international reputation of the Arnold Arboretum is due largely to this excellent collection of woody plants, their accessibility to scientists as well as to the general public, and the publications of the staff derived from the study of these plants. The Arboretum staff over the years has not only acquired



Peter Raven, chairman of the Arnold Arboretum Visiting Committee, toasts the Howards at party in their honor. To his left is Bernice Schubert, who helped plan the affair held in the Harvard Faculty Club on June 30. Photos: P. Chvany.



Associates fete George Pride on the occasion of his retirement. Photo: P. Chvany.

and grown plants but has shared these material resources in an uninterrupted program. Most of the plants, in fact nearly all those noted for their colorful flowering characteristics, were acquired from eastern Asia at the beginning of this century in a series of expeditions by Ernest H. Wilson, Charles S. Sargent, Joseph Rock, and John G. Jack for the Arboretum staff. The propagation staff kept excellent records of the treatments used to attempt germination of newly acquired seeds, and the horticultural staff maintained records on their growth, performance, and survival. It is these records that serve as background information on the treatment of new introductions, or the need to seek more hardy plants from northern sources or to share marginally hardy plants with other gardens in more suitable locations.

During September and October Drs. Spongberg and Weaver traveled in Japan and Korea, collecting seeds and plant material for propagation. They assembled and returned expediently by air mail 504 collections representing 326 taxa and sixty-eight families of flowering plants; the majority of the collections represented potential additions to the living inventory. The speed of transport, one week by air on the average, contrasted with the slow boat passage employed by the early collectors. Fresh seed requiring no stratification could be germinated immediately, while other seed could be cleaned or properly stored in Boston, eliminating much of the arduous effort previously expended in the field. Germination has been excellent except for the maples, and some seedlings have already been distributed.

A notice of thirty-two taxa to be distributed was published in the *Newsletter* of the American Association of Botanical Gardens and Arboreta, and resulted in requests from thirty-three institutions for 226 plants. Seedlings in shorter supply were made available to a



more select group of fifteen institutions. A large number of taxa will be retained at the Arnold Arboretum for mass plantings in our nurseries for evaluation of form, variation and hardiness. The director and staff are grateful to colleagues in Japan and Korea for the assistance afforded Drs. Weaver and Spongberg, and in particular for the help of Mr. Carl Ferris Miller of Korea and Dr. Katsuhiko Kondo and Professor Kankichi Sohma of Japan.

In anticipation of Dr. Howard's trip to China, the staff prepared units of seeds of twelve taxa for distribution to appropriate botanical gardens in the People's Republic. In addition, leaves of various cultivars of *Streptocarpus* introduced by the Arnold Arboretum, and plants of *Cyrilla racemiflora* were given to the botanical garden at Kamchow (Canton) for internal distribution. From Nanking Botanical Garden Dr. Howard was able to obtain a few seeds of *Sinocalycanthus sinensis*, not known in the United States, and to present in return seeds of *Calycanthus floridus* from the United States. A few additional seeds were collected from wild plants near Kunming. Earlier during the year Dr. Y. C. Ting of Boston College had obtained seeds of *Magnolia biondii* from China. The Arboretum staff was asked to handle these, and the plants developed will be distributed at a later date.

The living collections in Jamaica Plain are subject to continuous, systematic or casual examination by the staff responsible for maintenance, records, and labels, or for the nomenclature of the plants. New additions, or deletions or name changes, are recorded in Arboretum files and reported to the Plant Sciences Data Center of the American Horticultural Society. A new printout of the plants living in our collections is in preparation, and will incorporate additional information on sources. Maps of the plantings are revised on a regular basis, and additional color-coded or display labels are provided systematically. The collections of the Arnold Arboretum remain the best named and labeled cumulation known to the staff. Special attention this year was given to the identifications of the *Carpinus* and *Betula* species, and to an evaluation of the *Syringa* (lilac) taxa. Many unnamed, spontaneous seedlings were evaluated and marked for further study, or removed as undesirable plants. A list of taxa represented by single plants has been prepared, and these plants are being propagated in order to have additional specimens in the collection and for distribution to other gardens. Many of the plants within the Arboretum inventory seem particularly desirable for horticultural use, but for a variety of reasons are not available to the public from commercial sources. The techniques of propagating such plants are being studied, and small plants will be made available in the future.

The New England area escaped the ravages of hurricanes during the fall season and damaging ice storms during the winter. However, new records for snowfall were experienced when 22 inches of snow fell on Jamaica Plain and Weston on January 28, and 29 inches on February 6 and 7. Windblown drifts piled the snow deep, and an emergency situation was declared by the governor of Massachusetts



Bussey Hill summit planting completed in 1974. Photo: P. Chvany.

after the second storm. Staff members were not permitted to travel to work, and a special commendation is due Mr. Robert G. Williams, superintendent of buildings and grounds, and Mr. Thomas Kinahan, superintendent of the Case Estates, for the attention and care they gave to the facilities of the Arnold Arboretum. Several of the crew were able to walk to work, and their efforts in digging out the greenhouse area and the administration building for oil delivery prevented a serious situation from developing when oil supplies ran critically low. The clear skies that followed the storm were accompanied by strong winds that caused burning and desiccation of the tops of plants above the snow line. Many broadleaved evergreens were seriously damaged, and flowering of others in the spring was restricted to the lower branches. Rodent damage under the snow was particularly severe. The grounds at Jamaica Plain and Weston were inaccessible for many weeks after the storm as our own equipment could not handle the deep snow. The staff took the occasion to do inside work with the refurbishment of the administration building display areas, library, and locker room for the grounds staff. A combination internal fire alarm and emergency alarm system also was installed in the administration building.

A previous report mentioned the effort to acquire the land adjacent to the Arnold Arboretum known as the Adams-Nervine property. Restrictions on the use of the buildings in their designation of historical significance led to the withdrawal of an offer presented to their trustees. Subsequently the property was sold to a consortium of commercial developers who are proposing a change in zoning to permit the construction of high-rise apartments. The proposal to create a boardwalk over a storm sewer through the meadow in front



of the administration building, also reported previously, was approved by the Harvard Corporation. It was determined that the conduit had been installed by the Arnold Arboretum; therefore, city approval, which had been sought, was not necessary. Before the contracts could be prepared, however, a second proposal to the city was approved to permit the Arnold Arboretum, through its own funds, to reconstruct deteriorating sidewalks and gates. Although these are stated in the lease to be the responsibility of the City of Boston, their poor condition was not only unsightly but hazardous. During the spring two contracts were completed to renovate the large driving gates and the pedestrian gates along the Arborway, and to remove and replace two 1,000-foot units of sidewalk from the Forest Hills gate to the lilac collection on one side and the ponds on the other. Renovations provided better entrances for handicapped persons, and improved the appearance of the areas.

For many years the Arboretum has hired students for work on the grounds in Jamaica Plain and in Weston during the summer months. For some students this was graded work as part of the work-study requirements of their own educational programs. Others had requested certification or academic credit. During the spring and summer of 1977 a Horticultural Trainee Program was organized on a trial basis, permitting the students to enroll in the Harvard Extension Division, pay tuition, and receive a formal training with four hours of academic credit. The course Biology E-146C, Botanical and Horticultural Practices at Arboreta, was developed and supervised by Drs. Spongberg and Weaver, with the participation of many other members of the staff. Regular class meetings were scheduled as lectures, tours of the Arboretum collections, and tours of other plant

collections in the New England area. Each student chose a special research project and, in addition to taking an examination, presented an oral and written report on the project. Thus, thirty-two hours per week were devoted to regular assigned work on the grounds, and eight hours to instruction and research. Special noontime lectures and weekend field trips were optional opportunities. Eleven students from seven colleges and universities participated for credit; four students were not eligible for college credit, being high school students. Several research projects were deemed worthy of publication, and one on *Cornus dunbarii* was published in *Arnoldia*. On the basis of staff experience with the 1977 program, that of 1978 was revised and restricted to students working in Jamaica Plain. The transportation requirements of students employed in Weston proved excessive. The entire program will be reevaluated at the end of the summer of 1978. In order to give students additional attention and to judge work habits, Mr. Henry Goodell, assistant superintendent of buildings and grounds, assumed full responsibility for ground crews and student work assignments, freeing some time for the other responsibilities of the superintendent, Mr. Williams. A new staff position for a pruner was advertised and filled.

During the spring of 1978, a three-quarter-acre section of the South Street tract was made available on a trial basis for community gardening projects. The area was plowed in the fall, top dressed with leaf mold, and disc harrowed in the spring. A local committee of interested persons was established to assume full responsibility for the garden area. They will attempt to have the city, through the Boston Urban Garden Program (BUG), install a water supply. At the end of the spring over seventy-five garden plots had been assigned and seemed to be productive.





Young gardeners inspect bean crop in South Street community gardening plot.

Photo: E. Gray.

The horticultural staff in Jamaica Plain, with the help of volunteers where possible, handles all visitors to the grounds, answers questions in person and by telephone and letter, supplies identifications of plant specimens, and conducts guided tours for professional visitors and interested groups. To ease one aspect of this work, an answering device, delivering a recorded message on a twenty-four-hour basis, has been installed on the primary telephone line. In future telephone directories this will be designated as a recorded message. Ms. Nancy LeMay prepares the recording weekly, supplying informa-

tion on hours, directions, exhibitions, lectures and classes, and the plants in flower. Specific requests are referred to a second line, and frequently callers have commended the message in a second call. The service has reduced the number of office-hour calls for general information, and has provided coverage outside of regular hours and on weekends. To determine the nature of specific calls, a record form to be filled out following each call has been in use this spring. The compilation of the data has indicated the nature of specific plant queries: e.g., outbreaks of disease, potentially poisonous plants, and elaboration of news items of botanical or horticultural interest.

In the previous annual report, reference was made to a questionnaire that was distributed to the visitors on the grounds. The information obtained was often specific as to conditions on the grounds or the goals and needs of the visitors, and has prompted some changes and improvements in the facilities. A new questionnaire, distributed by mail to the Friends of the Arnold Arboretum, produced a good percentage of returns, with references to services, facilities, publications, and programs. We can respond with changes that will increase the support of the Arboretum, improve our contributions, and provide programs to meet the needs of the public. The often-stated request for a guidebook to the living collections has spurred staff efforts to produce such a publication within the next year.

No count of the visitors to the Arnold Arboretum is possible. The pedestrian gates to the grounds are open twenty-four hours a day, and visitors desired and undesired are present from daybreak to late night hours. Professional visitors are many, who come to use the herbarium or consult the living collections and the staff. Special tours during the year were arranged for such professional groups as the annual convention of the American Nurseryman's Association, the Garden Writers' Association, and the Massachusetts Horticultural Congress. Groups of students with a capable instructor, or requiring a staff or volunteer guide, represented twenty-one colleges, high schools, and technical or vocational schools, and came to the Arboretum to study the general collections or for some specific reason, e.g., a visit to the herbarium, library, or greenhouses. Tours were arranged for garden clubs, plant societies, and alumni or special study groups from city educational programs. A special gift for the purchase of a voice projector has eased the tour leaders' task.

During the fiscal year 225 shipments of plant materials, comprising 1,004 taxa, were distributed to cooperating institutions and nurseries, or supplied following specific requests for study material from individuals in thirteen countries. In addition, approximately two thousand rooted plants of *Salix melanostachys*, the Black Pussy Willow, were mailed to Friends of the Arnold Arboretum. The Arnold Arboretum also contributed seeds to the distribution program of the American Horticultural Society. A total of 197 shipments, consisting of 1,293 taxa, were received from twenty-seven countries as gifts or

distributions, or in response to requests from the staff for plant material for research programs. Following an examination of our living collections, 263 taxa were propagated to prepare replacements for specimens that appeared to be failing, or that suffered severe winter damage. Another 141 items were propagated for distribution programs or for staff research programs.

The greenhouses of the Arnold Arboretum are primarily for research. While the grounds and collections around the greenhouses are open to the public during regular hours, the glass areas are open for general visitors one afternoon a week, with information and surveillance supplied by volunteers. Sections of the greenhouses are available for research associated with thesis preparation of students working with staff members. Such diverse plants as *Brunfelsia*, *Lyonia*, *Portlandia*, and *Viburnum* currently are maintained for study; propagations of tropical species not hardy in the Boston area will be distributed at a later date to more appropriately located gardens. Staff members maintain plants in the greenhouses in work associated with research projects on the Gentianaceae and Gesneriaceae, and on the floras of southeastern United States and the Caribbean Lesser Antilles. The greenhouse staff is largely responsible for the acquisition and preparation of plant materials to be used in educational programs and exhibits. The Arnold Arboretum exhibit at the Spring Flower Show of the Massachusetts Horticultural Society was entitled "Up Against the Wall," and involved urban space of walls and small garden plots treated in four different ways. The walls supported vines, espaliers, or hanging plants, while the garden areas were developed for vegetables, herbs, pot plants, and living space. The plant materials for this exhibit were prepared by the greenhouse staff.

The Arboretum staff was represented at many meetings of professional societies during the year, usually presenting contributed papers or taking part in symposia. Included were the annual as well as regional meetings of the American Association of Botanical Gardens and Arboreta, the International Plant Propagators' Association meeting and meetings of the American Horticultural Society, the Hemerocallis Society, and the Massachusetts Horticultural Congress. Staff members served as judges at the Spring Flower Show of the Massachusetts Horticultural Society and took part in the programs of the Roxbury-Dorchester Beautification Committee, the Massachusetts science fairs, and the Worcester County Horticultural Society Daylily Show. Mr. Gary Koller was elected to the board of directors of the Jamaica Hills Association, the neighbors of the Arboretum in Jamaica Plain, and was elected a trustee of the New England Wildflower Society. He also organized and chaired the Plant Collections Committee of the American Association of Botanical Gardens and Arboreta. The Arnold Arboretum has collaborated for many years with societies and individuals in the registration of new cultivars, primarily of woody

plants. Dr. Sponberg serves officially as the chairman of the Nomenclature and Registration committees of the AABGA, and those of the American Horticultural Society. In such capacity he is also a member of the International Commission on Nomenclature and Registration of the International Society for Horticultural Science.

Case Estates

The Case Estates of the Arnold Arboretum in Weston, Massachusetts, are located thirteen miles from the principal living collections in Jamaica Plain. The 110 acres of the Case Estates are open to the public, are used for classes and research, and serve primarily as nursery areas for developing plants and as a holding area for plants that cannot be accommodated easily in Jamaica Plain. We were very much pleased when the Case Estates were awarded a gold medal by the Massachusetts Horticultural Society with the citation: "A long overdue award to a valuable teaching and testing resource, including natural areas specializing in herbaceous and woody materials of year-round interest." In addition to the annual spring open house, the grounds were included in a tour of the prizewinning gardens, and the number of visitors seems to increase as the area becomes better known. One of the showy portions of the Case Estates plantings in recent years has been the result of the breeding work of Mr. Pride with *Hemerocallis*, the daylily. Two of his selections received Junior Citations as seedlings during the year. His work with tetraploids has had national recognition, and several of his selections recently introduced have been featured in horticultural publications during the year.

Herbarium

The herbarium collection of the Arnold Arboretum is divided, with an herbarium of plants under cultivation housed in the administration building in Jamaica Plain, and noncultivated specimens, representing the native floras of the world, located in Cambridge. The herbarium in Jamaica Plain is housed adequately in metal cases, and has room for expansion. Currently it includes the majority of the specimens of *Crataegus* assembled in support of the work of Charles Sargent and Ernest Palmer, and the collection of *Yucca* gathered for the studies of Susan McKelvey. Specimens are first filed systematically and secondarily in geographic arrangements; thus during the past year a collection of cultivated plants from Kenya and from New Caledonia could be identified readily from the plants assembled in the herbarium, even though the taxa were not represented among the holdings from the two countries. A collection sent in exchange by Longwood Gardens proved rich in herbaceous material cultivated in Pennsylvania, and was added to the cultivated herbarium. An attempt was made to represent in the herbarium all taxa included in Rehder's *Manual of Cultivated Trees and Shrubs*, and as new cultivars are registered and herbarium specimens supplied, these, too, are added

to the herbarium of cultivated plants. Specimens added during the year numbered 1,707, bringing the total number of sheets to 163,268.

The herbarium collection in Cambridge is housed with that of the Gray Herbarium, and represents one of the most significant collections in the United States. As of June 30, 1978, the total number of accessioned herbarium sheets in the combined herbaria is 2,860,070, of which 1,780,682 are the property of the Gray Herbarium, and 1,079,388 belong to the Arnold Arboretum. Crowded cases and inadequate housing have been mentioned in many previous reports, and "temporary" housing in cardboard boxes has increased annually to the present total of 2,677 Merrill cartons so employed.

Within the last two years some steps have been taken to improve conditions to help resolve curatorial, educational, and research problems created by the limited space in the Harvard University Herbaria building. Preliminary approval by the University permitted the employment of architects to consider the problems and propose solutions. In last year's report it was indicated that the Corporation had approved an addition to the front of the herbaria building, and preliminary plans were used as a basis of cost estimates and a quest for funding for the construction and for the establishment of an endowment to cover future maintenance and operations. The search for funds was less than successful, but after further consideration of our needs, the Corporation approved the construction of the building with funds available. The future operational charges are to be handled in annual budgets unless, or until, additional money becomes available.



The addition to the building will represent 19,950 square feet gross space, and 14,450 square feet of programmed space in a basement and four floors compatible with and freely connected to the present building. The present building has 41,500 gross square feet. Our new professorial suite will be designated, but remain unfinished. Office-laboratory units numbering twelve will be included in the addition. The library area will gain 1,360 square feet in the present building, with renovations increasing the reading room space, and developing an archival area and a workroom. The herbarium will lose space in the present building, but will gain 5,200 square feet in the addition. The use of a compactor storage system of movable cases will provide ultimately the equivalent of approximately 1,176 new cases. The *Crataegus* and *Yucca* collections housed in Jamaica Plain will be moved to Cambridge. All material currently held in cardboard boxes will be accommodated in steel units. Although space will be available for twenty-four compactor units, available funds may limit the initial installation to sixteen units or fewer, the equivalent of 784 cases. Additional compactors will be purchased when funds are obtained. A large lecture room of 1,152 square feet and a smaller conference room will be created on the ground floor. The present basement seminar room will be renovated as a second laboratory, replacing one lost in the development of the professorial suite. A cold room, a growth chamber area, an instrument room, and a chemical room will be built. A small lift will aid the access of handicapped persons to the lecture and rest rooms. Construction documents were distributed in June for bids returnable July 13, 1978, with construction to be completed for occupancy by December 9, 1979.

Much staff time has been spent in committee meetings planning the details of the herbarium addition. The use of compactors for storage often requires explanation to those who have not seen these mobile units. The compactor saves floor space by utilizing custom-built units of herbarium file cabinets on tracks that permit units to be moved together for sealed storage or separated for access to the specimens. Although such units are commonly used for storage in libraries, and by various companies for records, their use in herbaria is less well known. The earliest units were in use fifteen years ago in Geneva, Switzerland, and they have been adopted recently for herbarium use by the Missouri Botanical Garden and the California Academy of Sciences. The compactors proposed for the herbarium addition will not be motorized, but will be operated by hand levers. The units are to be housed in small rooms that can be fumigated individually to overcome problems of insect infestation and leakage of fumigants.

During the year 8,335 specimens were received for the herbarium of the Arnold Arboretum: 5,623 in exchange programs; 412 as gifts; 460 purchased by support of expeditions; 1,522 collected by the staff; and 318 accessioned from material sent for identification. The largest numbers came from the United States and Canada, Australia, Papua

New Guinea, India-Pakistan, South America, and the West Indies. Specimens mounted totaled 11,459, representing another slight inroad on the backlog of accumulated specimens.

The activity of the herbarium may be judged by a number of items. Professional visitors, as recorded in a visitors' book, numbered 123 people using the herbarium, and represented sixty-four institutions and twelve countries. Many visitors stayed for more than a single day. A total of 263 loans were made in response to requests, 161 domestic and 102 international, representing 14,261 and 12,469 specimens respectively, or a total of 26,730. Loans of 1,099 specimens were received by staff members, and 1,795 returned. Loans for students represented 1,166 specimens, with 2,196 specimens being returned as students finished their work. The total number of specimens from the combined herbaria remaining on loan at the end of the fiscal year numbered 104,670, 60% to domestic institutions, and 40% international.

The crowded conditions in the organized herbarium necessitated the removal to dead storage of specimens unidentified at the genus level, to permit fully identified material to be inserted. Since this practice is clearly undesirable, individual staff members attempted, when time permitted, to supply identifications at least to the generic level. Dr. Peter Stevens devoted considerable time and identified the great majority of the Western Malesian material, and in a series of meetings with graduate students and staff in informal sessions once a fortnight began identification of undetermined material from South America.

Shifting and splitting over-full folders continued to occupy a substantial amount of curatorial time. Specimens from the geographic area we recognize as "India" have been put in new genus covers, replacing an inferior quality paper cover used initially.

Work continued on integrating photographic negatives, formerly housed in Jamaica Plain, with the larger negative file in the combined herbaria. A total of four thousand negatives of types or authentic specimens have been catalogued and curated, with about one thousand remaining to be done. New photographic negatives added to the file numbered ninety-three, representing twenty-nine specimens on loan to staff members, and the remainder taken of material requested by botanists in other institutions.

During the administration of Dr. E. D. Merrill, and before the days of convenient photographic methods, rubbings were made of herbarium specimens in many European herbaria, and fragments of the specimens were obtained. A substantial number of these are types, and those from Berlin may be especially important because the original specimens may have been destroyed. A collection of four thousand additional rubbings and fragments were found in storage, and curating work on them is under way. Labels are prepared for the rubbing and/or fragment, and the material is placed in acid-free envelopes or packets for appropriate insertion in the herbarium.

Much of the herbarium curatorial work is possible through a grant from the National Science Foundation which supports work in several herbaria as well as in the libraries of the Gray Herbarium, Botanical Museum, Arnold Arboretum, and Farlow Herbarium. A sum for the acquisition of compactors for the building addition is included in this recently approved grant renewal.

The combined herbaria received as a gift forty-six volumes of approximately 4,600 specimens as *exsiccatae* assembled by a firm of agricultural merchants in France in the late 1800s. These volumes of historical interest in identifying cultivated and economic plants of the period will not be accessioned, but will be considered as library volumes and deposited in Jamaica Plain for appropriate use.

The projects of individual staff members are various, and completed publications are listed in the staff bibliography. The work in progress ranges from studies of fossil to modern floras, and involves many geographic areas. Dr. Hu, although retired, is preparing a flora of Hong Kong and the New Territories. This work is supported by one grant from the Chinese University of Hong Kong and another to the Chinese University from the Division of Scientific Research and Higher Education of UNESCO. Dr. Hu's research also involves medicinal plants used by the Chinese people, with special interest in ginseng. In July 1977 she participated in conferences held in Lugano, Switzerland, and Munich, Germany, on the uses of ginseng. In April 1978 she flew to Hong Kong for a consultation meeting on medicinal plant research in southeast Asia, sponsored jointly by UNESCO, the Institute for Advanced Research in Asian Science and Medicine of New York, and the Chinese University of Hong Kong. Following the presentation of her paper on Botanical Resources of Medicinal Plant Research in Southeast Asia, Dr. Hu accepted an invitation from Academia Sinica in Peking, People's Republic of China, and spent five weeks at botanical institutions in Peking, Suchow, Nanking, Shanghai, Lushan, and Canton, presenting lectures to many groups. Dr. Hu also has been appointed to the editorial board of the American Journal of Chinese Medicine.

Dr. Howard continued his work on the Flora of the Lesser Antilles, and in two field trips visited fourteen islands for field studies and collection of plants poorly represented in herbaria, such as aquatic flowering plants, Araceae, Agavaceae, and Cactaceae. While on the island of St. Kitts he spoke on the local flora to students at the Behavioral Science Foundation, conducted several field trips, and helped identify plants apparently used as food by the local populations of monkeys. Under Dr. Howard's direction, Ms. Annette Aiello completed her doctoral dissertation on "The Genus *Portlandia* (Rubiaceae)" and received her degree in March.

Dr. Norton Miller continued cooperative studies with Professor Gary G. Thompson of Salem State College on the late-glacial plant fossils from a site in northern Vermont-New Hampshire. This rich

deposit contains fossils of numerous kinds of vascular plants and mosses, and has revealed some novel phytogeographic data. Dr. Monte Manuel visited the herbaria for several days to work with Dr. Miller in their revision of the moss genus *Trachyloma*. Mr. Peter Albert, under the direction of Dr. Miller, is investigating the ecological significance of poikilohydry and desiccation tolerance in desert mosses. His work has been supported by grants from the Atkins and Fernald funds, and by the Farlow Herbarium. Miss Cecilia Lenk is conducting field studies on the Gaspé Peninsula, Quebec. She is investigating the pattern of late- and postglacial vegetation development, and factors responsible for the present ranges of several ecologically important tree species that reach their distributional limits near the Gulf of St. Lawrence.

Dr. Lily M. Perry, officially retired but very active in daily work in the herbarium, finished her manuscript on "Medicinal Plants of East and Southeast Asia: attributed properties and uses." Ms. Brooke Thompson-Mills assisted Dr. Perry in seeing the manuscript retyped in photo-ready copy. The work has been accepted by the M.I.T. Press for publication and distribution.

Dr. Schubert is writing treatments of the genus *Desmodium* for the Flora of Ceylon, which is being prepared at the United States National Herbarium; for the Flora of Panama, being prepared at the Missouri Botanical Garden; and for a revision of the genus for all of Africa. She will present material on the Desmodieae (Leguminosae-Papilionoideae) at the International Legume Conference to be held in Kew, England, subsequently to be issued as part of the Proceedings of the Conference. Several weeks were spent in consultation with Dr. Rogers McVaugh in a joint effort on the genera *Desmodium* and *Dioscorea* (Dioscoreaceae) for his Flora of Nueva Galicia, Mexico.

Dr. Spongberg continues his work toward a manual of cultivated trees and shrubs with a series of family treatments being published separately. Ms. Robin Lefberg has prepared many of the illustrations for this new manual under Dr. Spongberg's direction. Grants from the Stanley Smith Horticultural Trust and the Charles E. Merrill Trust have aided the production of illustrations. Dr. Spongberg's treatment of the Crassulaceae for the Generic Flora of the South-eastern United States is in press.

Dr. Peter Stevens is nearing the completion of his large monograph of the genus *Calophyllum* (Guttiferae), and continues his general studies of the flora of Papua New Guinea.

Dr. Carroll Wood, in spite of a heavy teaching schedule, edited manuscript for the Generic Flora of the Southeastern United States, which is published as available in the *Journal of the Arnold Arboretum*. The success of the publication of plates, initially prepared for the Generic Flora, as *A Student's Atlas of Flowering Plants*, called for an expanded new edition covering more genera and families. Dr. Wood supervised the artistic work of Ms. Karen S. Velmure in the prepara-

tion of thirty plates of plants heretofore poorly or inadequately illustrated. Three students have been preparing doctoral dissertations under his direction. Mr. Walter Judd completed his thesis, properly entitled "A Monograph of *Lyonia* (Ericaceae)," and has accepted a position as assistant professor in the Department of Biology at the University of Florida. Mr. Christopher Campbell has under way a biosystematic study of the *Andropogon virginicus* complex in southeastern United States. A National Science Foundation student thesis grant to Dr. Wood has supported two seasons of field work, and Mr. Campbell presented his findings to the present at the meetings of the Botanical Society of America. Mr. Michael Donoghue is working on the genus *Viburnum* in Central America, where a concentration of species in Chiapas, Mexico, and in Guatemala required field study. Grants from the Atkins and Anderson funds have supported this field work.

Library

The approved plans for the addition to the Harvard University Herbaria building do include changes in the library, and the staff was involved in discussions with the building committee throughout the year. The reading area of the library will be increased by approximately 312 square feet. A new workroom, measuring about 504 square feet, will be available for supporting staff. To the rear of the library, and separated by a wire grille, is a section of the herbarium. This area will be added to the stack area of the library and represents a gain of 920 square feet. The herbarium will be moved into the new addition. A passageway from the rear elevator to the new addition will be a wide corridor with eighty linear feet available for lockable files and cabinets to be used for the storage of archival material. The photocopy machine currently on the first floor will be moved to a position outside the library reading room for greater convenience of the principal users.

An item for retrospective cataloguing, included in the National Science Foundation curatorial grant which ended during the fiscal year, was not renewed, and cataloguing activity in the library has been reduced significantly.

The lack of a second trained cataloguer on the staff of the combined libraries of the Arnold Arboretum and the Gray Herbarium is handicapping the routing to the shelves of new acquisitions and the treatment of uncatalogued materials. This process can be eased with (1) additional personnel; (2) the adoption of the Library of Congress classification, using such printed cards or those of CIP (cataloguing in publication); or (3) shelving new acquisitions in the Library of Congress system and recataloguing the remainder of the collection as time and funding permit. The conversion from the present in-house system of classification, developed and maintained for over one hundred years, would be a major effort, and would re-

quire funding by special grants sought for the purpose, as well as collaboration with closely associated botanical libraries in the community.

A new federal copyright law went into effect January 1, 1978, and requires good records of materials photocopied for research, class use, or interlibrary loan requests. The staff has been instructed on the provisions of this law, and its effects on library practices will be assessed at the end of the year.

During the year the librarian attended the annual meeting of the Council on Botanical and Horticultural Libraries, held in Denver, Colorado. Library assistants have attended workshops on MCSS and CONSER procedures.

The libraries were aided in collection maintenance by the current curatorial grant, and 133 volumes were treated by deacidification of paper, rebinding, and repair of volumes. Two volunteers continued work in Jamaica Plain on refurbishing leather-bound volumes. To keep staff, students, and faculty informed of new accessions, title pages and content pages for books received each week have been photocopied and displayed in the reading room, with the designation "Received This Week."

With the addition of 471 volumes and pamphlets, the Arnold Arboretum Library contained 86,300 items at the end of the fiscal year. The use of the library in Cambridge, where records are kept of books shelved each day, increased by 5% during the year. No such records are kept in Jamaica Plain, and in neither library is a record kept of the volumes reshelved by the scientific staff after their use. Requests for interlibrary loans or photocopies decreased during the year, but the actual number of requests filed was more than double that of the previous year. In part this is associated with the special work and service involved in assisting the visitors preparing *Taxonomic Literature II* and *Bibliographia Huntiana*.



Volunteers

Some institutions call them aides, helpers, guides, or docents, but with appreciation we recognize as volunteers the willing people who donate their time, effort, and talents to the activities of the Arnold Arboretum. The use of volunteer help has continued to grow in the number of people participating, in the scope of their services, and in the total number of hours they have contributed. Nearly every activity of the Arnold Arboretum staff receives and benefits from their versatile assistance, and only through their efforts is the Arboretum staff able to conduct the programs scheduled. Some like to be out-of-doors and help with inventories of nurseries, mapping, or labeling of plants on the grounds, or the collection of seeds. Some like to talk and serve as guides for tours of the grounds, supervise visitors to the greenhouses, or teach special courses for the Friends. Some are artistic and supply educational displays, aid in special classes, or help in the preparation of flower show displays. We value the help received in the herbarium, the library, the greenhouses, and the grounds; on special projects, and on routine duties; in preparing book reviews, or in the contribution of articles for *Arnoldia* based on individual research initiative. One volunteer during the year visited a famous European botanical garden with a letter of introduction from the Arnold Arboretum and the request for permission to prepare herbarium specimens from plants on the grounds. The request was granted with the provision that a second set of specimens be prepared for the local herbarium. Institutions on both sides of the Atlantic gained from the efforts of this volunteer. The volunteers are indeed an asset to the Arboretum, and have our sincere thanks for their help.

Education

The educational contributions of the Arboretum staff are both formal and informal. Staff members with academic appointments have offered formal courses in the University in the Department of Biology (Biology 18, 103, 148), the Harvard Summer School (Biology





Christmas holiday decorations class. Photo: M. Reynolds.

S-105), and the Harvard Extension Division (Biology E-146C). Many have students in graduate and undergraduate research courses or supervise advanced degree programs. Some serve on departmental committees as undergraduate advisors, or, at the graduate level, on thesis development or for qualifying examinations. Staff members have participated in courses offered primarily by other biologists as guest lecturers on topics of their specialty in the Department of Biology and the Graduate School of Design's Department of Landscape Architecture. Seminar series, both formal and informal, are many within the University, and members of the Arboretum staff have organized the series or offered lectures.

Less formal courses, lecture series, individual lectures, and demonstrations have been offered in Jamaica Plain and Weston. Through a cooperative agreement, the staff accepted three students as "interns" for special training in horticulture, with the students receiving academic credit through their own colleges. Two of these students undertook projects that will lead to publications, and required use of the herbarium, library, and living collections. A series of noon-hour lectures were offered biweekly in Jamaica Plain, and an invitation was extended to residents of Jamaica Plain through a listing in the local paper. When one notice was included in a calendar of events in a Boston paper, the audience filled the auditorium in the administration building. When Harvard University began a cable TV series within the University, the Arboretum staff was asked to participate on a regular basis, and did so with live and taped segments involving the living collections and the greenhouses. Staff members appeared as guests on TV programs of three stations, and on two radio talk shows where questions were answered on the air.

A questionnaire was sent to eastern regional libraries regarding

Volunteers A. Kathleen Daly (left), Nathaniel Whittier, and Janet Thompson pack seedlings of Salix melanostachys for mail distribution to Friends of the Arnold Arboretum. In background are Louis Segal (left) and Albert Thompson.

Photo: M. Reynolds.

their use of traveling exhibits. The response was more than favorable, and staff, with the aid of volunteers, prepared portable exhibit material to be displayed in cases or used as wall exhibits, which are now being seen in suburban libraries. Four exhibits were staged in the lecture room of the administration building. The exhibit on the plants mentioned in the writings of William Shakespeare was opened with a festive reception and a lecture by volunteer Mrs. Richard Warren, who was responsible for organizing the exhibit. Volunteers Mrs. Warren and Mrs. Frank Magullion cooperated in a holiday exhibit of dried and preserved plant materials. Water colors of botanical subjects by the late Edith Farrington Johnston were loaned to the Arboretum for an exhibit of native and tropical wild flowers. The fourth exhibit, during the spring flowering season, was assembled by staff members and described the nature and use of the herbarium. The Arboretum had an exhibit of Plants for Holiday Use at the winter show of the Massachusetts Horticultural Society; and in the spring show, a demonstration of wall and garden landscaping techniques. Both shows were staffed with the aid of volunteers to answer specific questions and to encourage support of the Arnold Arboretum through membership in our Friends organization.

Open house was held in Jamaica Plain and in Weston during the spring season, and many tours were conducted. A special workshop in the cataloguing of Kodachrome slides was held in the administration building, a bonsai workshop in the greenhouses, and a daylily workshop in Weston, to mention only a few of the special events.

An educational film entitled "Plant Propagation: From Seed to Tissue Culture," was completed by Mr. Peter Chvany for the Arnold Arboretum. We are indebted to the Massachusetts Society for Promoting Agriculture, and to special Friends of the Arnold Arboretum, for the grant and gifts that supported the production of this film. The film was accepted by Macmillan Films, Inc., for duplication and distribution, for which the Arnold Arboretum will receive royalties. The film has been entered in competitions, and in the first entry won the Golden Eagle Award from the Council on International Non-theatrical Events. The second film of the three produced by Mr. Chvany, "Poisonous Plants," won the bronze Chris Award in the Medical Service Category at the Columbus, Ohio, film festival. The original film on the Arnold Arboretum, produced for the Centennial Celebration in 1972, continues to draw approval from audiences as an explanation of the role of an arboretum. The film was shown twelve times during Dr. Howard's visit to the People's Republic of China, where the audiences were particularly interested in the specimens of native Chinese plants, such as *Cornus kousa*, *Davidia involu-crata*, *Kolkwitzia amabilis*, and *Metasequoia glyptostroboides*, shown under cultivation. The herbarium storage and the mounting techniques were new to the Chinese audience, and the use of maps and labels was the subject of comments.

E. H. Wilson, when collecting for the Arnold Arboretum in China, took many photographs of plants, people, and places. An issue of *Arnoldia*, written in 1976 by Mr. Chvany, was a consideration of Wilson as a photographer, and had reproductions of a few of Wilson's photographs made from the glass negatives in the files of the Arnold Arboretum. In 1978 the Philadelphia Museum of Art was given permission to include several photographs in an exhibit entitled "Photography of China from 1850." The exhibit was also written up and the photographs were reproduced in the *New York Times Magazine*. Interest still remains in using the Wilson photographs in a general historical account of his travels or in a book on China. Many of the photographs of individual plants are of lasting interest, since they represent plants from which Wilson collected seed, or the type tree when the plants proved new to science. Copies of these photographs remain of scientific value, and sources of funds for another reproduction and distribution are being investigated.

Travel and Exploration

Arboretum staff members gain professionally in representing the institution at science and professional society meetings, both in the United States and abroad. Meetings provide an opportunity to visit a different area, to present papers, share experiences and gain information, take photographs for teaching or for use in publications, study collections, or collect specimens for personal research or for the Arnold Arboretum herbaria. Staff members may travel to fill requests for lectures to horticultural groups or university audiences. A period of distant travel may be part of a regular course, or the course itself may be conducted in a distant location. Special field work may be necessary for the development of research programs or for the benefit of the Arnold Arboretum collections. Travel by the staff is supported to a modest degree, through two special endowment travel funds, from the general unrestricted Arboretum budget, or from special grants for the purpose. Staff travel during the year, outside of Massachusetts, impressive in toto, met these characterizations.

Mr. John Alexander participated in a seminar on the storage of woody plants at the International Plant Propagators' Society meetings in Columbus, Ohio, and attended the annual meeting of the Lilac Society at the Tyler Arboretum in Media, Pennsylvania.

Mrs. Ida Burch attended the annual meeting of the American Association of Botanical Gardens and Arboreta in Hamilton, Ontario, Canada.

Mrs. Lenore Dickinson took part in the Denver, Colorado, meeting of the Council of Botanical and Horticultural Libraries.

Dr. Howard attended the annual meeting of the American Horticultural Society in Pasadena, California. He completed two field trips collecting plants for his *Flora of the Lesser Antilles*. The islands of Puerto Rico, St. Thomas, St. Croix, St. Martin, Saba, St. Eustatius,

St. Kitts, Antigua, Barbuda, Guadeloupe, Les Saintes, La Désirade and Martinique were visited briefly in a search for specimens of cacti, aroids, agaves, and gingers, poorly represented in herbaria. In May Dr. Howard traveled to Hongkong en route to a twenty-eight-day tour of botanical institutions in eight cities in the People's Republic of China.

Dr. Hu presented a paper at a special meeting in Switzerland on the medicinal uses of ginseng, and later at another in Hongkong before visiting the People's Republic of China on an invitation from Academia Sinica.

Mr. Koller took part in horticultural meetings at the Morris Arboretum and the Swarthmore Horticultural Foundation in Pennsylvania, and attended the annual meeting of the AABGA in Hamilton, Ontario.

Ms. Donna Lynch also attended the annual AABGA meeting.

Dr. Miller conducted field work in northern Vermont; attended the AIBS meetings in East Lansing, Michigan, and the Botanical Society of America meetings in Blacksburg, Virginia. After each he participated in field forays associated with the meetings. He contributed a paper at the AAAS meetings, Pacific Division, held in Seattle, Washington, and stopped in San Francisco and St. Louis on the return trip for a study of the use of compactors in herbaria.

Mr. Pride participated in the annual meetings of the Hemerocallis Society in New Haven, Connecticut, and of the Gesneriad Society in New York.

Miss Margo Reynolds and Mr. Shaw attended the regional meeting of the AABGA held at the Brooklyn Botanic Garden.

Dr. Sponberg, along with Dr. Weaver, collected for the Arnold Arboretum in Japan and Korea in the fall. He later participated in the AABGA meetings in Hamilton, Ontario.

Dr. Stevens taught a course in Tropical Botany at the Fairchild Tropical Gardens in Miami in the summer of 1977, and again in 1978.

Dr. Weaver collected with Dr. Sponberg in Japan and Korea, and later reported on their trip at the regional meeting of the AABGA at the Brooklyn Botanic Garden.

Dr. Wood also taught in the summer school tropical botany course in Miami in 1977, and had the opportunity of preserving materials needed for his work on the Generic Flora of the Southeastern United States.

Gifts and Grants

The Arnold Arboretum derives its operational income primarily from the interest on invested gifts or bequests of past years. The income may be unrestricted and for general purposes, or restricted for specific uses or projects. We are fortunate to have the gifts from the Friends of the Arnold Arboretum, which are solicited by annual request for additional support. Occasional gifts are for specific purposes, but most are unrestricted and for immediate use. Memorial gifts are gratefully received and acknowledged. Gifts of materials

plants, books, or specimens are welcomed. Staff members also apply for grants in support of their own research or travel. Gift income is difficult to budget accurately, but amounts in excess of budget provision are held in special accounts to be used in subsequent years.

Two donors who wish to be anonymous gave gifts for capitalization during the year for the care of the collections of the Arnold Arboretum. A grant from The Stanley Smith Horticultural Trust, still in effect, supplies artistic aid to the research of Dr. Spongberg. A similar grant from the Charles E. Merrill Trust has been used to prepare for publication the manuscript of Dr. Perry, and for work on the manual of cultivated trees and shrubs.

Dr. Howard received a grant from the American Philosophical Society for support of field work completed during the year in the Lesser Antilles. Dr. Miller received a grant from the Milton Fund of Harvard University for investigations of fossil deposits in the upper Connecticut River valley. Dr. Schubert received a grant from the Tozier Fund for the purchase of projectors for the herbaria.

Publications

The two regular publications of the Arnold Arboretum are the *Journal of the Arnold Arboretum*, issued quarterly, and *Arnoldia*, issued six times a year.

The Journal of the Arnold Arboretum is edited and managed by Ms. Elizabeth Schmidt under the direction of Dr. Schubert, who serves with Drs. Spongberg, Stevens and Wood on the editorial committee. These and other staff members assist in the review of manuscripts. The four issues of the *Journal* published during the year comprised 468 pages, with twenty-two articles by twenty-six authors. A new cover illustration for the 1978 volume, representing leguminous fruits growing in the Arnold Arboretum, was prepared by Ms. Velmure, and takes note of the International Legume Conference being held at Kew during the summer. The price of the *Journal* was raised to \$25 per volume without noticeable effect on the regular distribution list of 715 copies. Kraus Reprint Company in New York, which handles orders for back numbers, has indicated that volumes 1-55 (through 1974) are available in original or reprint copies. Subsequent volumes are not complete but will be reprinted in the future.

The six annual issues of *Arnoldia* are edited by Mrs. Jeanne Wadleigh with assistance from Miss Reynolds. Numbers issued during the year comprised 251 pages, with a total of twenty-three articles by twenty-five authors. The book reviews were written by ten members of the staff and volunteers. The special issue of *Arnoldia* on Poisonous Plants is nearly depleted. A small interim reprinting is planned pending a review and revision of the contents. The reprint which sold for \$1.00 has proved to be useful as a home reference, and the multiple copies that were purchased by several organizations for distribution have exhausted the supply.

RICHARD A. HOWARD

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Left to right front row: J. Hicks, J. Skarstad, J. Stevens, R. Lefberg, E. Schmidt, B. Thompson-Mills, L. Dickinson, K. Velmure, L. Sahagian, C. Hesterberg, D. Talbot, L. Perry, B. Schubert, M. Reynolds, N. LeMay, B. Epstein, A. Sholes, M. Pelkus.

Row 2: R. Howard, W. Kittredge, M. Canoso, C. Wood, J. Alexander, R. Weaver,



S. Geary, D. Lynch, I. Burch, J. Wadleigh, E. Twohig, L. Colon, R. Famiglietti, S. Sponberg, D. Harris, R. Williams.

Row 3: M. Sheehan, V. Antonovich, M. Gormley, P. Ward, A. MacNeil, J. Burrows, H. Goodell, G. Koller, B. McCutcheon, J. Nickerson, R. Nicholson, T. Kinahan, R. Benotti, M. Belson, T. O'Leary, A. Navarro.

Absent: H. Fleming, P. Stevens, N. Miller.

Photo: P. Chvany.

Staff of the Arnold Arboretum 1977-1978

Richard Alden Howard, Ph.D., Arnold Professor of Botany, Professor of Dendrology and Director

Donald Wyman, Ph.D., Horticulturist, Emeritus

John Herbert Alexander III, A. of Sci., Plant Propagator

Ida Hay Burch, B.A., Staff Assistant

James Alvah Burrows, B.S., Assistant Plant Propagator

Michael Anthony Canoso, M.S., Manager of the Systematic Collections *

Constance Tortorici Derderian, A.B., Honorary Curator of the Bonsai Collection

Lenore Mikalauskas Dickinson, M.S., Librarian *

Sheila Connor Geary, B.F.A., Assistant Librarian

Arturo Gómez-Pompa, Dr. Sc., Honorary Research Associate *

Henry Stanton Goodell, Assistant Superintendent

Thomas Matthew Kinahan, Superintendent, Case Estates

Walter Tobey Kittredge, B.S., Senior Curatorial Assistant *

Gary Lee Koller, M.S., Supervisor of the Living Collections

Donna Anne Lynch, Curatorial Assistant

Norton George Miller, Ph.D., Associate Curator and Associate Professor of Biology *

George Howard Pride, M.A., Associate Horticulturist (Retired June 30, 1978)

Margo Wittland Reynolds, B.A., Staff Assistant

Elizabeth Belding Schmidt, M.A., Assistant Editor of the Journal of the Arnold Arboretum

Bernice Giduz Schubert, Ph.D., Curator and Senior Lecturer on Biology

Kenneth Dwight Shaw, B.S., Assistant Supervisor of the Living Collections (Resigned June 30, 1978)

Stephen Alan Sponberg, Ph.D., Horticultural Taxonomist

Peter Francis Stevens, Ph.D., Assistant Curator and Assistant Professor of Biology

Karen Stoutsenberger Velmure, B.A., Botanical Illustrator

Jeanne Stockbarger Wadleigh, B.S., Editor of Arnoldia

Richard Edwin Weaver, Jr., Ph.D., Horticultural Taxonomist

Robert Gerow Williams, B.S., Superintendent

Carroll Emory Wood, Jr., Ph.D., Curator and Professor of Biology

* Appointed jointly with the Gray Herbarium



NOTES FROM THE ARNOLD ARBORETUM

WEATHER STATION DATA FOR 1977

	Avg. Max Temp. *	Avg. Min. Temp.	Avg. Temp.	Extreme Max.	Extreme Min.	Precipitation +	Snowfall
Jan.	29.8	9.7	19.75	47	-1	5.1	19.4
Feb.	37.6	19.1	28.35	53	5	2.49	9
Mar.	52.9	32.5	42.7	89	19	5.55	10
Apr.	62.5	37.1	49.8	90	22	4.3	trace
May	76.2	48.7	62.45	96	32	3.75	1.0
June	77.6	55.2	66.4	87	43	4.15	—
July	85	62	73.5	103	48	3.01	—
Aug.	84.2	60.6	72.4	95	47	3.36	—
Sept.	72.2	54.5	63.35	92	42	4.65	—
Oct.	60.6	42.3	51.45	77	25	6.11	—
Nov.	51.4	37.0	47.2	75	23	4.22	.50
Dec.	36.8	21.5	29.15	52	3	6.44	7.5

* Temperature measured in degrees Fahrenheit

+ Precipitation measured in inches

Average maximum temperature 61.1° F

Average minimum temperature 40.0° F

Precipitation 53.13"

Snowfall 47.4"

Warmest temperature 103° F on August 22

Coldest temperature -1° F on January 18, 19 and 30

Date of last frost in spring May 10

Date of first frost in autumn October 25

* Growing season — 168 days

* Growing season — the growing season is defined as the number of days between the last day with killing frost in spring and the first day with killing frost in autumn. This time is determined by the last spring and the first fall temperature of 32° F or lower.

WEATHER STATION DATA FOR FIRST SIX MONTHS OF 1978

	Avg. Max. Temp.	Avg. Min. Temp.	Avg. Temp.	Extreme Max.	Extreme Min.	Precipitation	Snowfall
Jan.	33.96	16.38	25.17	57	4	8.92	33
Feb.	34.78	13.07	23.92	46	34.78	2.30	27+
Mar.	45	23.8	34.4	62	7	3.21	13
Apr.	55.9	36	45.95	69	29	1.93	—
May	69	46	57.3	92	29	5.25	—
June	81.1	54.9	68.0	91	43	1.39	—

Average maximum temperature	53.29° F
Average minimum temperature	31.69° F
Precipitation	23.0"
Snowfall during winter, 77-, 78	81"
Continuous snowcover	January 2-March 28, 1978
Warmest temperature	92° F on May 21 and 31
Coldest temperature	4° F on January 21
Date of last frost in spring	May 1
*Continuous temperature below 60° F	November 18, 1977 to March 22, 1978

* During the period the temperature never reached above 60° F; the average temperature was 34.6° F. This unusual uninterrupted cold spell was the major reason for the extensive damage to broadleaved evergreens and borderline-hardy trees and shrubs.

+ *THE BLIZZARD OF 1978* February 7th and 8th.

27" of new snow on top of 10" of existing snow. Snow drifts of 4-8' were recorded.

JAMES A. BURROWS



Photo: M. Reynolds.

Botanical Impressions of the People's Republic of China

by RICHARD A. HOWARD

In May and June 1978 I had the opportunity of visiting the People's Republic of China as one of ten delegates representing the Botanical Society of America. Members of the delegation had been selected from applications, and had various interests and specialties: physiology, agriculture, marine biology, paleobotany, morphology, genetics, and systematics. Bruce Bartholomew of the University of California Botanical Garden, Thomas Elias of the Cary Arboretum, and I represented botanical gardens and arboreta. We had twenty-eight tightly scheduled days visiting botanical institutes, universities, forestry institutes, academies, botanical gardens, communes, public parks, temples and pagodas, and the usual tourist attractions. We received general impressions of land use, agriculture, and forestry, as we traveled by car, train, or plane. The group was split occasionally to accommodate special interests of the delegation, or to allow individuals to present lectures. We had a few opportunities to examine native vegetation. As a group we visited the karst formations, called the Stone Forest, outside of Kunming, and even collected a few seeds and specimens in that location. Two days were spent by the botanical garden people at Seven Star Lake and on Ting Hu Mountain, northwest of Canton, where additional specimens, fruits, seeds, and living plants could be gathered from wild sources. Fundamentally, however, our purposes were to see, learn, communicate, and reestablish scientific contacts with our colleagues in China.

Our group entered the People's Republic from Hong Kong, and visited in succession Canton, Kunming (the first delegation permitted in this area), Shanghai, Hangchow, Soochow, Nanking, Wuhan, and Peking, before returning to Canton and exiting again via Hong Kong. Throughout the trip we were the guests of the Academy of Sciences. Our arrival had been anticipated everywhere, and we were graciously welcomed and our every need met, from personal laundry to cold drinks. Our biographies and bibliographies had been submitted beforehand, so that our colleagues knew our interests and publications, and even our faces. Regrettably, we were not equally well prepared, for our itinerary was given to us on our arrival. Representatives of the China Travel Service met our party at the border, and in Canton three members of the staff of the Botanical Institute in Peking greeted us and remained with us throughout the trip. One

*Staff of Institute of Botany,
Shanghai, greeting our dele-
gation.*



*Staff of South China Botan-
ical Garden (Canton).*



*Delegation of Botanical So-
ciety of America and staff of
Institute of Botany, Peking.*



*Orientation meeting in
Shanghai.*

served as official translator, but fortunately two members of our party who are Chinese by birth aided immeasurably in conversations, in translations of our lectures, and in a myriad of ways, answering questions for the majority of our party unable to read, speak, or understand the several dialects encountered. Equally fortunate for us was the ability of many of the senior Chinese botanists to recall the English they had learned as students in the United States, or earlier in China. Today English is the second language in the People's Republic. Instruction in the language is obligatory for service personnel everywhere, and there are many hours of English lessons on the radio each week.

There were interesting formalities to our trip and our meetings. The official translator communicated the itinerary and daily plans to the designated leader of our party, who then relayed the information to us. We traveled mostly by Chinese-manufactured automobiles in a convoy to our destination. The lineup of five to eight cars in front of the airport, railroad station, or hotel, was impressive, and drew an attentive audience for we were conspicuous in our appearance, dress, and size. Except in Peking the convoy never stopped for a traffic light, and was given priority at every crossing. It is slightly disconcerting to drive in the wrong lane of traffic, but apparently the myriads of trucks are accustomed to being waved over to the side so that official cars can pass by the congested traffic. The combination of green and yellow traffic lights is the signal that a delegation is coming through.

When we arrived at our destination, the local staff had assembled on the doorstep for official and formal greetings; never did we wait for them. We were escorted to a meeting room where, after a formal, welcoming speech by our host, each of us was introduced with the presentation of our business cards; English on one side and Chinese characters on the other. The local staff also were introduced. An endless supply of tea was served everywhere throughout our trip. Tea leaves were in tall, covered, cylindrical cups, and at our arrival boiling water was poured initially and continually replenished. We had the local tea (*Camellia sinensis*) unsweetened, with the sole variation of a brewed, hot, sweetened tea made from the leaves of *Begonia fimbriatipulata* at Ting Hu Shan Arboretum, and later enjoyed this latter beverage in tall glasses as a most unusual iced "tea." Cigarettes were always present and offered. Our host then described the institution and its work, and conducted a tour for the entire party or arranged for its division. We learned that questions asked in the group meeting often wasted time, and yet individual questions during the tour meant that not all information was commonly shared. Formality prevailed initially in each meeting, with the statements given in Chinese and translated, or questions asked in English translated for a reply into Chinese, and the answer again translated. Commonly, as the subsequent tour progressed, all conversation was conducted in English with our knowledgeable colleagues.

In each city visited we were guests at a formal banquet sponsored by the local organization, or by the governmental division of the Academy of Sciences. We in turn gave two banquets, although our obligation was for only a final banquet in Peking. For a banquet the host group assembles first, and at an appropriate time receives the guests. Introductions and an exchange of cards, always with tea available, take place in a separate room or section of the banquet area for some moments of conversation before the meal. Wet towels, hot or cold, are passed before adjournment to the dining tables. Place cards designated our seating arrangements, and eventually each of us learned to recognize his or her name in Chinese characters. The host examined the menu, printed in Chinese, nodded his approval, and passed the menu around the table. Fortunately all members of our delegation had mastered the use of chopsticks and spurned the fork that was available if needed.

The banquet consisted of many courses, each comprising a few to several dishes. When you can use chopsticks to handle at one time several boiled peanuts, sugared walnuts, or lima beans served in tomato sauce, you enjoy a certain feeling of competence. Protocol requires that you help serve your dining companions. This often results in a confusion of chopsticks reaching dishes in the center of the table, until you suddenly notice that your more adept companions have piled your plate embarrassingly high with food. The soup course could appear anytime during the sequence. A sweet, cold, fruit soup was most enjoyable. Rice was available in large pots at regular meals for self-service, but it was the penultimate course served at a banquet just in case you were not satiated. A course in economic botany could be taught from the menus we enjoyed. A variety of meats, chicken, eggs, pork, beef, eels, crayfish, sea cucumbers, were accompanied by unusual vegetables (*Amaranthus*, *Bambusa*, *Zizania*, *Lotus*, *Typha*, algae and fungi), fruits (loquats, litchis, pomegranates, citrus), and seeds (*Ginkgo*, *Lotus*).

At each place were three glasses: in size, liqueur, wine, and tumbler. Beer and orange soda were regular offerings for the tumbler. A sweet red wine was always delicious, but the liqueur glass held an alcoholic beverage, called mao t'ai, a truly formidable potion. Early in the course of the meal the host made a speech, which was duly translated, and then he proposed a toast ending with "kan-pi (gam-bay)" — "bottoms up." One participated in the toast with the beverage the host had selected, and drank the glass dry. We came to dread the mao t'ai selection. Our leader then responded with a speech, usually working in a quotation from Chairman Mao, which was translated, and he also proposed a toast. As the meal progressed, toasts were frequent: to the group, to the table, to individuals; and even to the Ivy League, the Big Ten, and the Pacific Coast Conference. Meals always ended abruptly with little lingering for conversation.

Our hotels were the best tourist hotels in the big cities, but the

lasting impressions are of the small hotel at Seven Star Lake and the most charming Kwantung Guest House.

Each member of our party was prepared to deliver one to three lectures. I had taken with me a copy of the Centennial film of the Arnold Arboretum, which showed not only scenes on the grounds and views of selected trees, but also the methods of operation of the library and the herbarium, and the care of the living collections in equipment, mapping, labeling, and record keeping. In addition I had Kodachrome slides constituting a survey of other botanical gardens in the United States, and a technical talk on the vascular patterns of the stem, node, and petiole of Dicotyledons. The Arnold Arboretum was known throughout China, and at every introductory ceremony our host made reference to his pleasure that a representative of the Arnold Arboretum was present. I believe I spoke more times than any other member of the delegation, for the groups chose to see the Arboretum film. Projection equipment for the movie was excellent, although I generally had the sound turned off after the first few minutes and commented, for translation, on the plants and procedures shown. Screens for showing the film were not always adequate, and projection equipment for slides was generally poor. The audience reaction to the Arboretum film was surprising at first, and pleasing in anticipation later on. The film features spectacular flowering specimens of *Cornus kousa* var. *chinensis* (the Chinese dogwood), *Davidia involucrata* (the dove tree), *Kolkwitzia amabilis* (the beauty bush), and *Metasequoia glyptostroboides* (the dawn redwood). Although these plants were Arboretum introductions from China, the plants, with the exception of *Metasequoia*, were not seen in cultivation, and were unknown to the majority of the audiences. The audience reaction often drowned out the translation. This was true also with sequences in the herbarium depicting our filing system using colored genus covers for countries; the technique of mounting using a spray of adhesive; the free distribution of maps of the Arboretum collections given to visitors; the mapping system of collections; and the mechanical equipment, especially pruners using cherry-picker lifts on trucks. The anatomical lecture on stem structure that I was prepared to offer was never requested for a group. In fact, the only plant anatomists encountered were in Peking at the Botanical Institute, where these individuals requested a seminar discussion with me concerning the techniques I used and the results.

There were formalities to the lectures as well. The talk was scheduled, and when the host arrived with the speaker the audience was fully assembled and applauded our entrance. Senior botanists were in the front rows. Introductions were brief and in Chinese. Tea was present for the speaker and the senior botanists, and often during the talk the speaker was given a hot or cold towel. I found early an introduction that amused the audience by referring to the fact that the Chinese children were amazed by my height, 6'5". I was often called

by them "the giant," or the "two-meter man." I noted for the audience, with appropriate pantomime, that height was an advantage for a field botanist who could reach very high, but a disadvantage since one had to stoop in the bush to avoid hitting his head. I could also note that I might be the tallest taxonomist in the United States, but that I had a student who was 10 cm. taller than I was. The ice breakers helped capture the audience early. At the end of the talk there was applause, but rarely any questions. The audience remained seated until the speaker and host had left the lecture hall. Audiences ranged from sixty to three hundred, and the rooms used were always filled. The audience had been invited, and only a selected number from each department or institution was permitted to attend. In several cases the Arboretum film was borrowed to be shown again to an audience not able to attend my presentation.

Slide presentations were translated sentence by sentence, and had to be given slowly. Generally a member of the institute would translate, but we were grateful for the help of two members of our party, Dr. Jane Shen-Miller and Dr. William Tai, for their frequent help. They delivered their own talks in Chinese.

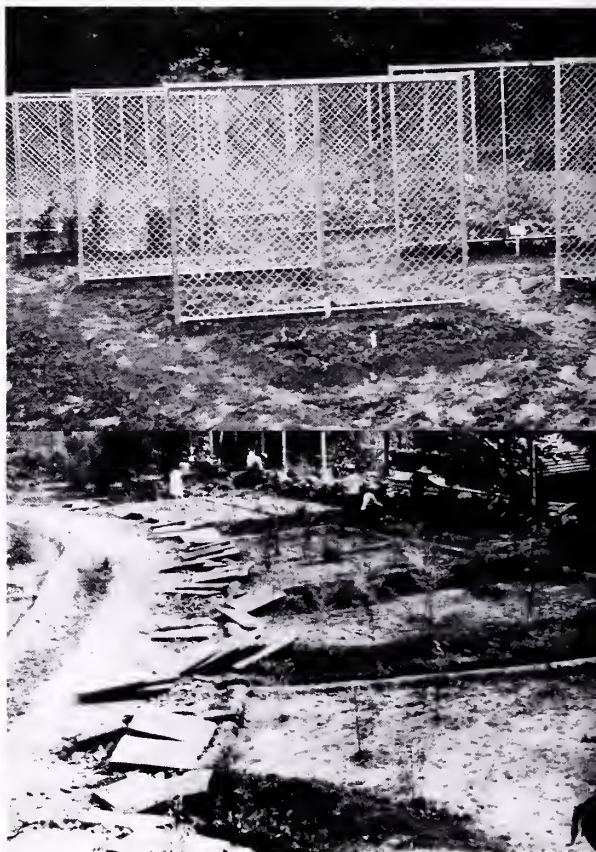
We also were given lectures by local botanists, occasionally in Chinese translated for us; or the speaker would speak in Chinese and then, himself, translate into English. A few senior botanists offered lectures in English, and we were most pleased to hear lectures by junior staff members in Peking read to us from manuscripts in English. Their effort required to do this was apparent and deeply appreciated. On two occasions we were shown 35 mm. films with commercial, theater-type projectors. One film, on a tropical research station near the Thailand border, and another on the Lu Shan Botanical Garden, were of special interest.

Our trip was possible following a major change in policy by the Chinese government last March. The statement, "We want to learn from you," was made at every institution, and at each we were asked to "criticize" their work. The policy of criticism within institutions was rampant during the Cultural Revolution, and apparently internal discussion sessions are still held weekly. Critiques can be addressed at the top administration or at fellow workers. We were told that salary increases also were awarded by the group after discussion, and it was still evident that no one wanted to be particularly conspicuous in dress or in research. We asked questions about the operations we saw, and these could be why, as well as what or how. So many institutions were using tissue culture techniques and studying another culture that we could ask why. Why are so many papers published without statement of authorship but instead presented as the effort of a research team or group? We could point out how difficult such papers are to cite in a bibliography, or indicate that the lack of authors' names precluded any contact with the person or persons actually doing the work. We saw photo-offset reproductions of current



*Pottery tubs for aquatic plants,
Hangchow Botanical Garden.*

*Herringbone pattern of chain
link fence for vines, Nanking.*



*Concrete slabs used to separate
plantings of bamboo, Peking.*



*Medicinal plant collection,
Wuhan.*

journals in several libraries. Although we knew that China does not subscribe to international copyright conventions, we questioned why, then, such copies were not in every library but only in a few. Some Chinese journals offer abstracts or summaries in a foreign language but many do not. Why? Some descriptions of new plant species may have a Latin description as required by the rules of botanical nomenclature, but then have details of collector and location only in Chinese characters. Why? These comments were denied at several locations, but could easily be demonstrated as facts. In good humor our Chinese colleagues suggested that our requests could be granted, but then asked if we could publish with our papers an abstract or summary in Chinese.

The discussion sessions were most successful in small groups or on an individual basis. Occasionally this was difficult due to the lack of sufficient translators. The three of us representing botanical gardens were asked to meet on several evenings with interested Chinese botanists numbering from twelve to twenty. It was on these occasions that questions that might have been asked following our talks were presented and discussed. The sessions were pleasant, and we felt they were mutually profitable.

Members of our party had brought with them gifts of seeds and plants, books, reprints, slides, and scientific specimens and artifacts representative of our institutions or section of the country. I took along packets of United States postage stamps, mostly botanical in nature, and found collectors interested in the gift. In Soochow some members of our party visited a small school and discovered on the wall a collection of postage stamps from various countries. Our caravan of cars made a special stop to give a set of postage stamps to the teacher to add to the display. Reprints of scientific papers of our group were presented formally to the director of each institute we visited. Another packet of materials on the Arnold Arboretum, along with some extra special seeds, went to the directors of botanical gardens. Our Chinese colleagues were most generous with their publications, so that by the end of the trip we were carrying heavy loads of books. Fortunately my luggage was counted and not weighed for the return trip. Most of the volumes were new to the library of the Arnold Arboretum, and some of the gifts represented books not previously available for export. Bookstores in China are numerous, and well stocked with botanical or horticultural items. Here we learned that a red sign stamped on the back indicated the book could not be sold to foreign nationals. However, the stores often had foreign publications on China, some very old and rare copies which could be bought and treasured. Reprint editions of foreign publications were cheaper than the originals still available outside of China. All of Darwin's books, for example, were available in Chinese translations and made interesting items for collection. In each city our guides made certain we were taken to the Friendship Stores, restricted

*Garden shelter and lake in
Shanghai Botanic Garden.*



Vandal-proof labels as concrete blocks, Shanghai.

*Study collection of Camellia
taxa and hybrids, Kunming.*



*Manual mist propagation
unit, Wuhan.*



to foreigners and foreign currency. Some were opened for us, and others were open at night. The largest store was that in Peking, which also had the highest prices and the largest number of customers. We could and did visit local stores, and were permitted to purchase such items as food and cloth for which ration coupons were required of the Chinese. In several small shops all customers were asked to leave the store when we entered. Our treatment was indeed special.

Although our schedule and itinerary were fixed, some changes were made at our request and some by necessity. Our flight from Canton to Kunming was delayed by the failure of the air conditioning system in the plane. Since Chinese airlines do not serve meals en route, the plane lands at mealtime and the passengers and crew enter the terminal for a meal. The delay awaiting a repair part on this occasion was handled by our guides' acquiring rooms for us at a nearby hotel where we "rested." We were to travel from Wuhan to Peking by train, but in the only schedule failure our hosts were unable to get train reservations for us. We flew instead, but a thunderstorm over Peking required a landing at Chêngchow where we waited for clearing. This did not happen, so after a long wait at the airport we were fed fried eggs, especially prepared at 11:00 P.M., and then taken to a hotel for an unexpected overnight stay. Photographs are not permitted from the plane or at airports, but each stop allowed us to see and photograph different plants used in landscape plantings.

We visited the Malu Commune outside Shanghai and enjoyed it immensely. A large painted sign awaited us which read in Chinese, "Welcome to the delegation of the Botanical Society of America." After the usual tea and the recitation of statistics on the operation, we visited several parts of the commune. We saw a new machine for planting rice; culture of mushrooms in bottles; hatchery for eggs; flocks of ducks; and herds of pigs, cows, buffalo, and other animals. In a basket factory we saw the production of baskets and mats from bamboo by carefully organized teams of workers. Wheat was being harvested by hand, and black mustard was being winnowed. We toured small factories producing "Ac'cent" and soy sauce. We were shown a "typical" apartment. However, we declined the invitation to visit the factories making soccer balls, or the shops repairing tractors, in favor of more botanically associated plantings and operations. Our wishes were granted.

At the end of our trip, on our return to Canton, the director of the Botanical Institute suggested that the botanists from botanical gardens might be more interested in seeing Seven Star Lake and Ting Hu Mountain 110 km. away, an overnight trip, rather than a university and a botanical institute. This gracious invitation produced a high point of the trip, scenic as well as botanical. Arising early in the morning, two of us climbed one of the karst limestone hills, and discovered at the top a handsome shrub loaded with slightly inflated

pink capsules. None of the Chinese botanists could identify the plant, which was a member of the Sapindaceae. Although no ripe seeds were available, I took photographs and collected several herbarium specimens which were later identified in Boston as *Koelreuteria minor*, the type species of a monotypic genus. This name had been changed, in an article in the April 1977 issue of the *Journal of the Arnold Arboretum*, to a new genus, *Sinoradlkofera minor* (Hemsley) Meyer. Little was known of the distribution or ecology of the plant, and Seven Star Lake was a new locality. The plant is not in cultivation in the United States, and a request has been made for viable seeds.

Throughout China we were impressed with the tree-planting programs in effect. These showed contrast between the wonderful shaded streets of the cities and the obvious delayed action of many of the afforestation programs. Since our visit ranged from the subtropical latitude of Cuba in Canton and Kunming to the latitude of Boston in Peking, the trees used were different in each area. In the south the denuded hills had been planted in species of *Pinus*, *Eucalyptus*, and *Acacia*. The current state of health and the shape of the plantings were not encouraging. Along the railroad tracks we saw extensive plantings of *Metasequoia*, *Salix*, *Populus*, *Cryptomeria*, and *Robinia* species, which as young plantations were cultivated or interplanted with vegetable crops, and obviously received more attention than did the forest plantings. We were told that over fifty million trees of the dawn redwood had been propagated from cuttings or grown from seed taken from the native plants which are now protected as a national treasure. Specimens of *Metasequoia* were planted not more than 4 feet apart, and the lower branches pruned to the trunk. We were told of plans to thin the plantations as they developed.

The street tree plantings were dominated by *Platanus orientalis*, the sycamore, pruned so that the lower branches were about 3 m. above the ground and topped to force branching. Pruning is done mostly by handsaw from bamboo ladders, and on a regular schedule so that the general impression is of neat, well-cared-for trees. An excellent handbook in Chinese, *Beautification of Cities and Environmental Protection*, was published in 1977 by the Kiangsu Institute of Botany for general use in China. In Canton the dominant street trees were *Aleurites fordii*, *Melaleuca quinquenervia*, *Sterculia nobilis*; in Kunming, *Grevillea robusta*, *Sterculia* and *Eucalyptus* species, mostly *E. camaldulensis*; in Shanghai, *Ailanthus altissima*, *Cinnamomum camphor*, *Firmiana simplex*, *Platanus orientalis*, *Pterocarya stenoptera*, *Salix babylonica*, *Sapium sebiferum*, and *Ulmus parvifolia* and *U. pumila*; in Peking, *Platanus*, several species of *Acer* and hybrids of *Populus*, and handsome avenues of *Cedrus deodara*. The greatest variety of street trees was seen in Soochow where the following were recorded: *Bischofia trifoliata*, *Celtis sinensis*, *Cinnamomum camphor*, *Firmiana simplex*, *Lagerstroemia indica*, species



Platanus orientalis as street tree in Shanghai.



Recently transplanted Salix and Populus, heavily pruned, in Peking.

Truck spraying insecticide on street trees in Peking.



Sophora japonica var. pendula in Forbidden City, Peking.



of *Ligustrum*, *Photinia serrulata*, *Pistacia chinensis*, *Pterocarya stenoptera*, *Salix babylonica* and *S. matsudana*, and *Sapium sebiferum*.

Along country roadsides trees were often planted in several rows, each of a different species. Areas between the trees were used as nursery beds or for the mass culture of seedlings. Trees were selected that would offer a spread and withstand heavy pruning. Trunks were commonly painted white with a mixture of lime and sulfur for insect control. We saw willows with trunk diameters of 15–25 cm., truncated at about 3 m. before transplanting, and each seemed to be developing a crown of branches. In Peking, *Populus* saplings, obviously close grown in nursery beds, had been pruned of branches and were planted as 7–8 m. poles. Especially in Peking we were aware of the tank trucks that traveled along the streets spraying the street trees, and the pedestrians, or carefully watering the bases of the newly planted trees.

Our first introduction to the Chinese use of plants in pots occurred at the hotel in Canton, and we were to learn later of an almost countrywide use of the technique. Fully an acre of land in the front of the hotel was a nursery, with all plants grown in pots or special containers. At the entrance, in the lobby, in the dining room, on floors, on room dividers, or on tables, were plants in pots, usually in flower and all in excellent condition for they were replaced frequently. Many of the plants were carefully grown annuals such as *Impatiens*, *Petunia*, *Tagetes*, or *Zinnia*, or trimmed shrubs of *Bougainvillea spectabilis*, *Clerodendrum trichotomum*, or *Lantana camara*. However, the palm *Trachycarpus fortunei* and flowering specimens of *Magnolia grandiflora* or cultivars of *Camellia* and *Gardenia* were also seen in larger pots. Some unexpected taxa as pot-grown subjects included *Chloranthus* sp., *Aglaea odorata*, and *Homalocladium platycladium*.

Travel on Chinese trains was an unexpected pleasure. The trains were always on schedule and immaculate in condition, with curtains on the windows and antimacassars on the seat backs of the first-class coaches. One woman wet-mopped the floor, commanding in accented English, "Life your feet." A small table extended from the clean window between the seats to hold the teacups, for which we were charged the equivalent of two cents for a cup of tea many times refilled. This table also held a potted plant. In our car were plants of *Buxus harlandii*, *Cineraria* sp., *Crassula arborea*, *Homalocladium platycladium*, *Ophiopogon* sp., and *Setcreasea purpurea*.

In our briefing prior to a visit to the Lung-hua Botanical Garden outside Shanghai, we were told they had twenty thousand potted plants in the collection. These proved to be "bonsai" of tremendous variety, and displayed in a most attractive manner. The moon gate is well known as an entrance form or gateway in Chinese architecture, but we saw the use of vista controls by many shapes of openings in walls or restrictions through the use of frames of bamboo or wood. "Bonsai" in Chinese are called p'ên-ching, literally meaning potted

scenery. In application there are single plants to group plantings. Very old and large plants of *Pinus parvifolia*, *Pinus tabulaeformis*, or *Punica granata* had been collected in the wild or from temple grounds. Some had been grown in pots for centuries. Delicate younger plants were trained in the western standards for bonsai and wired to grow to the effect desired. P'ên-ching plants seem to be classified for the effect achieved — single, erect, tiny trees; leaning or reclining plants; twin plants equal in size; mother and son, with one plant larger than the other; ascending branch style; over-the-water, with one or more horizontal branches; cascade style with branches descending below the pot; or forest scenes. Stems were often large and grotesque (*Ulmus parvifolia*). Roots could be displayed or hidden, and plants with prop roots or adventitious aerial roots were also used. *Acorus*, *Oxalis*, and *Hydrocotyle* were used in the pot. The pots themselves were glazed or unglazed, decorated with carvings or inscriptions, or plain in color and the shape of a stone formation. P'ên-ching plants could be at the base of the rock or on it. One or several plants or kinds of plants could be employed. Natural rock formations from the karst areas were used as sink gardens, the natural reticulum of stalagmite accretions accented by single or several plants. Miniature p'ên-ching were in the collections, displayed singly or in lacquered framework. Even picture frames with p'ên-ching were used as wall hangings. Lung-hua had the most outstanding, memorable collection of those we saw in China.

The botanic gardens of China suffered severely during the Cultural Revolution or from effects now blamed on the Gang of Four. For a period all were administered through the Academy of Sciences in Peking, but now each has independence although it may be related to a botanical institute or a university. The disruption of the Cultural Revolution involved the staff and the programs of the organization as well as the collections. For over a decade the staff were required to do practical work with the "people." They were assigned work outside and away from the garden for a period every year. At times people from the country, without training, were assigned to work in the garden. The garden was to be practical in its programs, and emphasis was removed from the maintenance of general collections to the development of economic plant collections, particularly those of medicinal value. Trees were cut down, plants pulled up and destroyed; greenhouses and laboratories were vandalized and indoor teaching collections obliterated. In the past few years there has been a partial recovery. We saw impressive botanical gardens in Canton, Nanking, and Hangchow. We learned of plans for the redevelopment of the botanic garden in Peking, and the establishment of others. In general, with the three exceptions noted, the maintenance of the gardens is poor, the collections poorly grown and poorly labeled, and the labor inefficient and ineffective. The older administrators, however, are aware of the impression and seem determined to develop again the gardens they once had. Their wish to "learn from others"

Pot culture of ornamental plants at hotel in Canton.



Pot plants in space dividers in airport terminal, Shanghai.



Ficus bengalensis as p'en ching (bonsai) in Lung-hua collection, Shanghai.

P'en ching of Ulmus parvifolia, Shanghai.

Commune team planting rice seedlings near Kunming.



Private enterprise garden plots, even between trees, Canton.



Unsuccessful forest plantings on terraced hill near Kunming.



Private gardens, on trellises and in roadside ditch near Canton.

was expressed for themselves and for their younger staff members. We heard many times of their desire, after "normalization" of relations with the United States, to travel themselves, and to have their younger colleagues visit American botanical gardens for periods of training and study. There is no retirement age for botanists in the Chinese botanic garden, and it will be through the influence of these older staff members that the gardens will benefit from the foreign exposure and training of the junior staff. We can only wish them long life and cooperation in their desires.

With the exception of the Hangchow Botanic Garden, those we visited were a considerable distance from our hotels and the center of town. We were assured there was public transportation for visitors, but it was often stated that "our garden is not a public park." Our visits were arranged, and previous delegations had not been able to visit the gardens we visited. Sections of some gardens were locked, and it was obvious that some sections were cleaned or labels recently placed in anticipation of our visit. We also visited many public parks and plantings in cities or around temples. We visited the Humble Administrator's Garden in Soochow on Children's Day, June 1, when school was out and over fifty thousand children were expected. This proved to be a classic example of overuse and population pressure on a garden area resulting in compacted soil, broken edges to lakes, trees polished from climbers' bodies, and litter from ices sold by vendors. By contrast, the river front park in Shanghai was immaculate and well groomed, and the Emperor's Garden in the Forbidden City in Peking a place to be long remembered.

It was possible for members of our party to visit several herbaria and to learn of the floristic and monographic work in progress. A *Flora of China* is being prepared by cooperation of individuals and institutes throughout China, to be completed by 1985. We asked for and were given lists of people working on specific families, and were presented copies of parts of the Flora that had been published. Large families are divided into parts, and in some cases only a few genera may be written up by a single worker, with the final compilation edited by a team in a different location. With few exceptions, herbaria seem adequately housed as to space with room for expansion. The vast majority of specimens were in wooden cases. Several systems of arrangement were used, and rarely did we see collections from outside of China. Mercuric bichloride is used to dip specimens newly received, and paradichlorobenzene moth flakes are used in the cases. The specimens generally lacked extensive field data, and were mounted on a low quality of paper. Recent annotations were infrequent. Each institution had a considerable backlog of material to be mounted, and we were told in several places that specimens were still in "storage" after having been removed during the Cultural Revolution. In one library this description applied to a room in which the books were literally thrown in the corner. Mounting techniques were antiquated, as specimens were affixed with paper strips inserted

in slots in the sheet and glued on the back or hand sewn. Occasionally two or more herbarium sheets were sewn together for texture rigidity. Bamboo specimens in one herbarium were mounted on folded sheets, double the normal size when opened. Type and authentic specimens were sometimes separated in special cases, or kept in special folders, but in other institutions we saw type specimens displayed in wall cases fully open to insects, desiccation, and light. Very little optical equipment was seen in our visits to several herbaria. We did not see the literature for taxonomic work comparable to what one finds in the office of a staff member of an American herbarium. Several institutions had prints of authentic specimens obtained years ago from Kew, the Arnold Arboretum, and the Gray Herbarium. Microfiche of important herbaria, available to western botanists, were not seen, and seemed to be unknown in several institutions. We were told staff members could borrow specimens from other institutions in China or could travel to consult other herbaria. Copies of needed descriptions could be obtained as "xerox type" reproductions from Peking. Borrowing specimens from outside of China was not a regular practice. In several lectures, movies, and slide shows, we learned of past expeditions to remote places in China. Whether a regular practice or only a demonstration for the picture, we did note that several small pieces of different plants would be placed in a single sheet in a field press. We were told that duplicate specimens were distributed within China, and that specimens were available on exchange to other institutions. When I asked of their interests for exchanges with the Arnold Arboretum, the reply generally was that plants of China were wanted. Fortunately we still have old collections that might be so used.

Staff members of the Arnold Arboretum before the second World War had borrowed herbarium specimens from various Chinese institutions. These could not be returned when work was finished or in the postwar years. The material has been carefully stored for nearly thirty years, and our desire to return these loans was mentioned during our trip. Some of the institutions from which the specimens were borrowed were church-related colleges, and no longer in existence. Our colleagues in the Academy of Sciences suggested that all specimens be returned to Peking, where the decision would be made as to where to house the specimens. The first shipment has been sent.

Our visit to the People's Republic of China was too intensive. As a visitor cannot possibly understand or fully appreciate the Arnold Arboretum in the course of a visit of one or two hours, neither could we absorb all aspects of the Chinese institutions and gardens in the brief time allowed. Nevertheless, our impressions are many and favorable, and will be long lasting. We did meet our goal of communicating with colleagues, and meeting the senior botanists whose work we knew and appreciated, as well as their younger associates. We understand their trials of the past decades and know of their facilities. Even in the few weeks since our return there has been

correspondence expressing the mutual pleasure derived from our visit. Our promises have been fulfilled carefully, and our subsequent requests have been granted. Expeditions comparable to those of Wilson and Rock for the Arnold Arboretum may still be several years away. Not all of China is open to foreign travelers. The field botanist may not expect tourist-quality hotels, but transportation and interpreters are available in short supply. Nevertheless, the future is hopeful. We will welcome the return delegation of Chinese botanists in 1979, and hope that our hospitality can be as satisfying to them as theirs was to us.

CHRONOLOGY OF TRAVEL OF THE DELEGATION

5/17/78	San Francisco to Hong Kong
5/19	Hong Kong: Botanizing on Victoria Peak
5/20	Hong Kong to Canton by trains
5/21	Canton: A.M. Botanical Garden of the Institute of Botany
	P.M. Visit to Methane Gas Plant using human waste
5/22	Kunming by plane with lunch stop at Nanning (provincial capital of Kwangsi)
5/23	Kunming: A.M. Botanical Institute and Botanical Garden
	P.M. Lectures by delegates
5/24	Kunming: A.M. Field trip to Stone Forest
	Evening Selected films
5/25	Kunming: A.M. Field trip to Western Hills
	P.M. Flight to Shanghai
5/26	Shanghai: A.M. Institute of Plant Physiology
	P.M. Visit to People's Commune of Malu
	Evening Performance of acrobats
5/27	Shanghai: A.M. Group divided: some to Lung-hua Botanical Garden; some to Institute of Biochemistry; some to lecture
	P.M. Academy of Agricultural Sciences
5/28	Shanghai: A.M. Visit to Industrial Exhibition
	P.M. Yu Gardens, old Shanghai and waterfront parks
5/29	Shanghai: A.M. Yutan University
	P.M. Lectures to Botanical Society of Shanghai; visit to Museum; departure by train to Hangchow
5/30	Hangchow: A.M. Visit to Botanic Garden
	P.M. Return to Botanic Garden; lectures; some of group to the University
5/31	Hangchow: A.M. Boat tour of West Lake and parks including Tiger Cave
	P.M. Visit to temples; train to Soochow
6/01	Soochow: A.M. Embroidery Institute; Humble Administrator's Garden
	P.M. West and East Gardens, temples
6/02	Soochow: A.M. Morning trip by train to Nanking
	P.M. Botanical Institute and Botanical Garden

6/03	Nanking:	A.M. Nanking University P.M. Nanking Technological Institute of Forestry
6/04	Nanking:	A.M. Lectures to Botanical Society of Kiangsu P.M. Visit to Yangtze River Bridge; Sun Yat Sen tomb; Lingko Park Pagoda
6/05	Nanking:	A.M. Botanical Institute P.M. Nanking University, Institute of Plant Physiology Evening Seminar discussion at Institute of Forestry
6/06	Nanking:	A.M. Trip to Wuhan by plane P.M. Visit to Wuhan Bridge and to temples
6/07	Wuhan:	A.M. Botanical Institute and Botanical Garden P.M. Wuhan University Evening Performance of acrobats
6/08	Wuhan:	A.M. Lectures at the Botanical Institute P.M. Academy of Agricultural Sciences Evening Performance of Chinese opera
6/09	Wuhan:	A.M. Boat trip on East Lake P.M. Flight to Peking delayed by storms; overnight in Chêngchow
6/10	Peking:	A.M. Arrived from Chêngchow P.M. Visit to Imperial Palace
6/11	Peking:	A.M. Visit to Great Wall P.M. Visit to Ming Tombs
6/12	Peking:	A.M. Visit to Botanic Garden P.M. Visit to Hsiang Shan (Fragrant Hills) satellite botanic garden and temples
6/13	Peking:	A.M. Botanical Institute P.M. Lectures by staff of Botanical Institute
6/14	Peking:	A.M. Lectures by staff of Botanical Institute P.M. Trip to Pei hai Park; discussions at Botanical Institute
6/15	Peking:	A.M. Lectures at National Science Museum and tour of Museum P.M. Peking University
6/16	Peking:	A.M. Flight to Canton P.M. Trip to Seven Star Lake and karst vegetation
6/17	Canton:	A.M. Ting Hu Shan Arboretum and mountain vegetation P.M. Return to Canton
6/18	Canton:	A.M. Train to Hong Kong
6/19	Hong Kong:	A.M. Flight to Los Angeles and San Francisco
6/20		Return flight to Boston

(All photographs in this article are by the author.)

ARNOLDIA REVIEWS

Park Maker: A Life of Frederick Law Olmsted. Elizabeth Stevenson. New York: Macmillan Publishing Co., Inc. 484 pages, illustrated. \$17.95.

In the past ten years, there has been a steady revival of interest in Frederick Law Olmsted, the designer of the Arnold Arboretum and the country's first professional landscape architect.

To name only a few of the most prominent titles, recent books include: Julius Gy. Fabos, Gordon T. Milde and V. Michael Weinmayr, *Frederick Law Olmsted, Sr., Founder of Landscape Architecture in America*, University of Massachusetts Press, 1968 (primarily a pictorial survey); Albert Fein, *Frederick Law Olmsted and the American Environmental Tradition*, Braziller, 1972; Laura Wood Roper, *FLO: A Biography of Frederick Law Olmsted*, Johns Hopkins University Press, 1973; and, most recently, the first volume of a long-awaited series: Charles Capen McLaughlin and Charles E. Beveridge, eds., *The Papers of Frederick Law Olmsted: Volume I, The Formative Years, 1822-1852*, Johns Hopkins University Press, 1977.

A reader may well ask where to begin. Prof. Fein's book is probably the best overview of Olmsted's life and work, but like others in the Braziller series on Planning and Cities, its text is brief. On the other hand, Roper's book is a monumental achievement, the result of thirty years' research, but its length and level of detail may discourage a reader new to the subject.

Elizabeth Stevenson, the author of several other biographies, including the Bancroft Award-winning *Henry Adams*, has written a book that is both scholarly and "popular" in the best sense of the word. Her main interest is in the man rather than his works. Most of Olmsted's design projects, including the Boston park system, are treated rather impressionistically. Similarly, the involved social and historical background of Olmsted's life is drawn in broad strokes. But Olmsted the man emerges as a complicated, courageous and sympathetic human being.

As is well known, Olmsted did not begin his landscape career until 1858, when he was thirty-six and, with Calvert Vaux, won the competition for Central Park. He had been a frail and dreamy boy with a sketchy education. As a young man, he first went to sea and then was subsidized by a patient father in a series of farming ventures. By the time he became involved in Central Park, however, he had written four books (one on England and three on the antebellum South) and had a modest national reputation.

Later in life Olmsted asked himself "how such a loitering, self-indulgent, diletante sort of man as I was . . . could, at middle age, have turned into such a hard worker and *doer* as I . . . have been ever since?"

The answer becomes apparent in Stevenson's first chapters. All the experiences of Olmsted's early life — boyhood wanderings through the Connecticut woods, perusals of Price on *The Picturesque* and Gilpin on *Forest Scenery* in the Hartford Public Library, informal study of civil engineering in Andover, Massachusetts and sporadic attendance at Yale, as well as his far from brilliant career as a scientific farmer — were synthesized in his later profession.

Perhaps better than any Olmsted scholar thus far, Stevenson understands the two sides of Olmsted's nature. Later in the letter quoted above, Olmsted said: "I have been selling being for doing." Stevenson responds: "He thought that he had warped the dreamer away from his dreams in order to work in the world. Yet . . . the dreamer and the *doer* had

worked together to make certain formed spaces open to the sky in which other persons might find freedom to be."

Olmsted's mature years were filled with this kind of "doing." Central Park completely absorbed him for four years, yet, at the start of the Civil War, he interrupted his landscape work to direct the United States Sanitary Commission (the predecessor of the American Red Cross). From 1863-5, he ran the Mariposa Mining Estates in California. He then returned to New York and collaborative work with Vaux on Central and Prospect parks. Throughout an increasingly busy career in landscape architecture, he wrote a stream of articles and professional reports and maintained a prolific correspondence. He also pioneered the nation's first conservation efforts at Yosemite and Niagara Falls.

Stevenson is most successful in her treatment of Olmsted's early life and of his last years. (The first third or so of *Park Maker* could well be read in conjunction with Volume I of the *Olmsted Papers*.) She gives particular attention to the projects in which Olmsted had the heaviest emotional investment: Central Park, his first born; and Biltmore in Asheville, North Carolina, one of his final achievements.

Biltmore was a project almost without parallel in the history of landscape architecture. In 1888, George W. Vanderbilt asked Olmsted for advice on treating the grounds of his new winter estate. For the main dwelling, the fashionable architect Richard Morris Hunt was designing an only slightly reduced version of the chateau of Blois. Vanderbilt steadily (and somewhat stealthily) acquired large parcels of land until his estate totalled 120,000 acres. His original aim had been to establish a park, but Olmsted persuaded him that the best use of the land was as a scientifically planned forest and arboretum. The first aim was magnificently achieved, although the arboretum project floundered and finally failed. Olmsted's involvement with Biltmore lasted until the end of his working life. Expertly managed by Gifford Pinchot and later by Carl Alwin Schenck, Biltmore Forest eventually became a national preserve.

Throughout his life, Olmsted struggled to have his landscape principles understood and his work recognized, not as a handicraft, but as a "liberal profession." Acclaim came to him toward the end. In one day, he received honorary degrees from both Harvard and Yale. Characteristically, he accepted the awards, not for his own sake, but because they dignified his profession.

One of Olmsted's chief concerns at Biltmore had been to arrange the plantings so that there would be a clear view of a distant mountain peak. Aptly enough, the name of the mountain was "Pisgah," after the ridge from which Moses viewed the Promised Land.

CYNTHIA ZAITZEVSKY

Compost Gardening. W. E. Shewell-Cooper. New York: Hafner Press. 119 pages. \$8.95.

This volume describes the methods and obvious success of organic gardening and its principles as applied in England. The author is indeed a missionary for the method and the book is enjoyable reading. Varieties and materials described, however, are not usually available in eastern North America. Illustrated in black and white and in soft-tone color.

RICHARD A. HOWARD



A SPECIAL DAY FOR FRIENDS

On October 15 the Case Estates parking lot began to fill early as Friends of the Arnold Arboretum arrived for the 1978 plant distribution. On the agenda this sunny, crisp autumn day were plant clinics, tours of the grounds, refreshments and socializing with staff and other Friends, in addition to such choice plant give-aways as *Ilex pedunculosa*, *Itea japonica* and *Neillia thyrsiflora*. Photographer Ed Gray was on hand to record the pleasant activity, and here are some of his impressions.





*ARNOLDIA is a publication of the Arnold Arboretum
of Harvard University, Jamaica Plain, Massachusetts, U.S.A.*

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